

INTERPRETIVE SUMMARIES, DECEMBER 2019

Invited review: Management strategies capable of improving the reproductive performance of heat-stressed dairy cattle. *By Negrón-Pérez et al., page 10695.* Heat stress is detrimental to the productivity of dairy cattle and negatively affects their fertility. The physiological mechanisms responsible for the observed reduction in reproductive performance during heat stress are many and varied, including direct and indirect consequences of elevated temperature. Decades of research experiments have been aimed at identifying management strategies capable of improving reproduction in heat-stressed dairy cattle. Investigated approaches encompass a myriad of opportunities, ranging from feed supplements to bull selection and embryo transfer. This invited review focuses on strategies that have demonstrated effectiveness and could be applied on-farm.
<https://doi.org/10.3168/jds.2019-16718>.

Bioactivity of hydrolysates obtained from bovine casein using artichoke (*Cynara scolymus* L.) proteases. *By Bueno-Gavilá et al., page 10711.* Artichoke flower proteases have been used to produce bioactive peptides from bovine casein. The bovine casein hydrolysates contain peptides with demonstrated antioxidant and antimicrobial activity and angiotensin-I converting enzyme inhibition in vitro. During identification of the peptides, we found a large number of additional bioactive sequences. These peptides could be used as ingredients in future functional foods. In addition, the use of the artichoke flower to obtain hydrolytic enzymes in the production of bioactive peptides would involve the use of an agricultural byproduct.
<https://doi.org/10.3168/jds.2019-16596>.

In vitro-digested milk proteins: Evaluation of angiotensin-1-converting enzyme inhibitory and antioxidant activities, peptidomic profile, and mucin gene expression in HT29-MTX cells. *By Giromini et al., page 10760.* We studied the bioactive effect of in vitro-digested whey protein isolate, casein proteins, and soy proteins in term of angiotensin-1-converting enzyme inhibitory activity (ACE1-I), antioxidant, and intestinal HT29-MTX-E12 cell metabolic activity and mucus production. Our results indicated that milk proteins had higher antioxidant and ACE1-I activity after in vitro digestion. Peptidomic analysis revealed that whey protein isolate and casein proteins generated potentially bioactive peptides mainly associated with ACE1-I bioactivity. We also found that specific concentrations of whey protein isolate, casein proteins, and soy proteins were able to promote metabolic activity of HT29-MTX-E12 cells and, in the case of casein proteins, *MUC5AC* and *MUC2* gene expres-

sion, suggesting that consumption of milk proteins can have a positive effect on intestinal defenses.
<https://doi.org/10.3168/jds.2019-16833>.

Short communication: Processed bovine colostrum milk protein concentrate increases epithelial barrier integrity of Caco-2 cell layers. *By Anderson et al., page 10772.* Bovine colostrum may improve human gut health. Our aim was to determine whether industrial processing affects the gut health benefits of colostrum. Colostrum improved small intestinal wall integrity only after processing, probably due to an increase in protein concentration compared with raw colostrum. In contrast, the ability of colostrum to alter large intestinal muscle contractions was not detectable after processing, indicating that the component responsible for that effect was destroyed or removed during processing. The beneficial effect of colostrum on intestinal integrity was present after processing, so it is feasible to produce a colostrum product for human gut health.
<https://doi.org/10.3168/jds.2019-16951>.

Effects of critical fluctuations of storage temperature on the quality of dry dairy product. *By Galstyan et al., page 10779.* Dried whole milk is a flexible long-shelf-life product. It is typically stored in a temperature range from 0 to 10°C. The range of negative temperatures for storage of dried whole milk has not been systematically investigated. In this study, we modeled dried milk storage and transportation conditions at -20°C with periodic thawing to 10 and 20°C. We established experimentally that storing dried milk at -20°C for 40 d does not significantly affect its characteristics. We observed some lumping, which could be eliminated by insignificant mechanical force. We artificially contaminated the packaging surface with yeast and molds and showed their absence after thawing.
<https://doi.org/10.3168/jds.2019-17229>.

Microbial safety status of Serro artisanal cheese produced in Brazil. *By Andretta et al., page 10790.* This study assessed the microbial safety of an artisanal cheese produced in the Serro region, Minas Gerais, Brazil. Despite the absence of microbial hazards usually associated with artisanal cheeses, we identified high counts of coagulase-positive staphylococci, indicating that good manufacturing practices must be improved to ensure production hygiene and quality.
<https://doi.org/10.3168/jds.2019-16967>.

The ability of spore formers to degrade milk proteins, fat, phospholipids, common stabilizers, and exopolysaccharides. *By Mehta et al., page*

10799. Spore formers are common spoilage-causing microflora in dairy products. In this study, we tested common spore formers, including *Bacillus*, *Geobacillus*, and *Paenibacillus* spp., for their ability to induce spoilage from proteolysis, lipolysis, or degradation of phospholipids, common stabilizers, and exopolysaccharides in sour cream and yogurt at fermentation temperatures. We determined that several strains have the ability to degrade protein, fat, stabilizers (gelatin, starch, xanthan gum, and pectin), and exopolysaccharides produced from commercial starter cultures, which indicates they can cause spoilage during sour cream and yogurt manufacture.
<https://doi.org/10.3168/jds.2019-16623>.

Rapid identification and quantitation of the viable cells of *Lactobacillus casei* in fermented dairy products using an aptamer-based strategy powered by a novel cell-SELEX protocol. By Song et al., page 10814. *Lactobacillus casei*, which is usually added to dairy products, has probiotic effects when it reaches a certain number of cells. Fast analysis of the amount of viable *L. casei* cells is of great significance for quality control and food surveillance. Here, by using 2 *L. casei*-specific aptamers obtained from a novel cell-SELEX protocol, rapid enumeration of *L. casei* in dairy foods was achieved within 1.5 h. Viable and nonviable *L. casei* cells can be effectively discriminated using the aptamer-based strategy, which is a powerful tool for food inspection and supervision.
<https://doi.org/10.3168/jds.2019-16693>.

A microbiological inhibition method for the rapid, broad-spectrum and high-throughput screening of 34 antibiotic residues in milk. By Wu et al., page 10825. In this study, we developed a microbiological inhibition method for the rapid detection of 6 types of antibiotics (β -lactams, aminoglycosides, tetracyclines, macrolides, sulfonamides, and lincosamides) in milk, which can be used to effectively monitor antibiotic residues in milk and protect human health.
<https://doi.org/10.3168/jds.2019-16480>.

Short communication: Physicochemical features and microbial community of milk kefir using a potential probiotic *Saccharomyces cerevisiae* KU200284. By Hong et al., page 10845. There has been increasing interest in probiotic dairy products prepared using novel materials. *Saccharomyces cerevisiae* KU200284 was isolated from cucumber jangajji and used as a probiotic starter in milk kefir. This probiotic milk kefir exhibited bioactive compounds, general physicochemical features, and increasing microbial composition of *Lactobacillus* spp. and *S. cerevisiae*. Therefore, *S. cerevisiae* KU200284 may have potential as a probiotic starter in the dairy industry.
<https://doi.org/10.3168/jds.2019-16384>.

Short communication: Molecular characterization and antimicrobial resistance of pathogenic *Escherichia coli* isolated from raw milk and Minas Frescal cheeses. By Ribeiro Júnior et al., page 10850. Milk and dairy products made fresh with raw milk may contain pathogenic microorganisms. In this study, we showed that Brazilian raw milk presents a microbiological risk through direct consumption or the consumption of dairy products made with unpasteurized milk because of the presence of pathogenic *Escherichia coli* strains. Minas Frescal cheeses produced from raw milk pose the same risk. Enteropathogenic and Shiga toxigenic *E. coli* present in raw milk and cheeses present antimicrobial resistance and probably originate from human fecal contamination.
<https://doi.org/10.3168/jds.2019-16732>.

Production of cheese from donkey milk as influenced by addition of transglutaminase. By D'Alessandro et al., page 10867. The processing of donkey milk into cheese is very difficult because of its chemical composition, which results in poor clotting activity and, in turn, a very weak gel on renneting. This study aimed to determine the effect of fortification with microbial transglutaminase enzyme for cheesemaking from donkey milk, using different treatment protocols. Addition of the enzyme when added with rennet improved curd firmness. These findings may be relevant in the design of new dairy products from donkey milk that would be beneficial to people affected by cow milk protein allergy.
<https://doi.org/10.3168/jds.2019-16615>.

Field bean inclusion in the diet of early-lactation dairy cows: Effects on performance and nutrient utilization. By Johnston et al., page 10887. The inclusion of up to 8.4 kg of field beans in dairy cow diets had no effect on dry matter intake, milk yield, or fertility, but reduced milk fat and milk protein concentrations. The latter may be due to a deficit of methionine in the diet, and it is possible that these effects could be avoided by supplementing diets high in field beans with specific amino acids.
<https://doi.org/10.3168/jds.2019-16513>.

Performance of dairy cows fed diets with similar proportions of undigested neutral detergent fiber with wheat straw substituted for alfalfa hay, corn silage, or both. By Kahyani et al., page 10903. This study evaluated the effects of feeding diets with similar proportions of undigested neutral detergent fiber (30-h incubation; uNDF30) by replacing corn silage (CS), alfalfa hay (AH), or both with wheat straw (WS) on performance of lactating cows. All diets supplied 17% of dietary dry matter as uNDF30, and beet pulp was added to balance diets for similar ruminal NDF digestibility (44.5% of NDF). The results showed that the substitutions did not influence milk production, but the

combination of WS and CS (WS substituted for AH) improved feed intake, ruminal pH, NDF digestibility, and energy balance of dairy cows compared with a diet with CS and AH.
<https://doi.org/10.3168/jds.2019-16869>.

Effects of processing methods (rolling vs. pelleting vs. steam-flaking) of cool-season adapted oats on dairy cattle production performance and metabolic characteristics compared with barley. *By Tosta et al., page 10916.* This study aimed to evaluate the effects of processing methods of cool-season adapted oat grain on dairy cow production. Cows fed dry-rolled oats produced more milk and showed the highest fat percentage compared with those fed steam-flaked or pelleted oats or dry-rolled barley. These results indicate that feeding a total mixed ration with dry-rolled oats provides the opportunity to increase milk production without degrading cow health and may allow higher economic returns to dairy farmers.
<https://doi.org/10.3168/jds.2019-16940>.

The effect of various doses of an exogenous acid protease on the fermentation and nutritive value of corn silage. *By Der Bedrosian and Kung, page 10925.* An experimental acid protease was added at 0, 20, 200, 1,000, or 2,000 mg of protease/kg to freshly chopped whole-plant corn at harvest and ensiled for 45 d. Treatment with 1,000 and 2,000 mg/kg resulted in silages with higher concentrations of ethanol and numbers of yeasts compared with untreated silage. The amino acid profiles of untreated silage and silages treated with 200 or 2,000 mg/kg were determined. Treatment with protease did not affect the total concentrations of essential, nonessential, or total amino acids in silage. The 200 mg/kg dose substantially improved ruminal in vitro starch digestion in corn silage without affecting the concentration of ethanol or numbers of yeasts and could be an alternative to waiting prolonged periods of time for an increase in starch digestion to occur via natural proteolytic processes during ensiling.
<https://doi.org/10.3168/jds.2019-16436>.

Influence of rate of inclusion of microalgae on the sensory characteristics and fatty acid composition of cheese and performance of dairy cows. *By Till et al., page 10934.* Long-chain n-3 polyunsaturated fatty acids such as docosahexaenoic acid (DHA) have human health benefits and are naturally high in microalgae. We fed different amounts of microalgae to dairy cows and found that milk and cheese content of DHA increased with the rate of inclusion, and saturated fat content decreased. Feeding microalgae increased the air holes in cheese and the nutty flavor and decreased the creaminess. Cow performance was unaffected, except

milk fat content, which was reduced as the feeding level of microalgae increased.
<https://doi.org/10.3168/jds.2019-16391>.

Predictions of ruminal outflow of essential amino acids in dairy cattle. *By Fleming et al., page 10947.* Predictions of essential amino acid outflows from the rumen were updated using revised estimates of amino acid composition of the constituent proteins and corrections for amino acid recovery during 24-h hydrolysis and compared with published ruminal amino acid outflows. Predicted flows had root mean squared errors averaging 31%, with average mean and slope bias of 13 and 1%, respectively, for the essential amino acids. Concordance correlation coefficients ranged from 0.34 to 0.55, indicating that predictions were moderately accurate and precise representations of the observed data, and may form a reliable basis for estimates of amino acid supplies in dairy cattle.
<https://doi.org/10.3168/jds.2019-16301>.

Modeling portal-drained viscera and liver fluxes of essential amino acids in dairy cows. *By Fleming et al., page 10964.* Models of splanchnic tissue essential amino acid (EAA) release were evaluated to assess accuracy in predicting release of EAA by the tissue and thus availability for peripheral tissues, including mammary. The portal-drained viscera clears moderate amounts of all EAA except Arg, with clearance activity declining as EAA supply increases. The liver was more active in clearing EAA except for the branched-chain AA, with activity increasing as supply increased. Splanchnic release of EAA can be predicted with relatively high accuracy and precision based on relatively simple models, but we found no clear advantage to using a more mechanistic approach rather than an empirical one.
<https://doi.org/10.3168/jds.2019-16302>.

Assessing availability of amino acids from various feedstuffs in dairy cattle using a stable isotope-based approach. *By Huang et al., page 10983.* Individual essential amino acid (EAA) availabilities were assessed for corn silage, grass hay, alfalfa hay, dried distillers grain, soyhulls, brewers grain, and corn grain using an in vivo method. Total EAA availabilities for those ingredients were 33.4, 29.9, 34.1, 40.6, 28.8, 41.2, and 36.5% of EAA in each ingredient, respectively, using the previous estimate of 8.27% EAA utilization by splanchnic tissues during first pass.
<https://doi.org/10.3168/jds.2019-16597>.

Intake and growth in transported Holstein calves classified as diarrheic or healthy within the first 21 days after arrival in a retrospective observational study. *By Morrison et al., page 10997.* Diarrhea is a recurring issue in calf management

systems, emphasized by the current data. Calves with diarrhea have reductions in feed intake, body weight gain, and feed efficiency. Initial serum total protein was not a good predictor for the development of diarrhea in calves. Diarrheic calves showed altered water intake from different sources compared with healthy calves. Diarrheic calves require supplemental electrolytes in addition to normal milk and ad libitum free water intake to help maintain fluid balance and overall total water intake. Understanding the water deficit that diarrheic calves experience is important in determining how to minimize the severity and economic impact of this disease in calves.

<https://doi.org/10.3168/jds.2019-16609>.

Effects of 5-aminolevulinic acid supplementation on milk production, iron status, and immune response of dairy cows. *By Hendawy et al., page 11009.* This study indicated that supplementation of 5-aminolevulinic acid (5-ALA) to dairy cows (10 mg per kilogram of dry matter) increased the count of white blood cells and granulocytes, as well as the rate of phagocytosis and mitogen-induced proliferation of peripheral blood mononuclear cells compared with the control group. Moreover, 5-ALA improved milk protein and milk casein contents. Results indicate that 5-ALA is useful for immunomodulation and improvement of milk composition in dairy cows.

<https://doi.org/10.3168/jds.2018-15982>.

Colostrum feeding and milk replacer feeding rate effects on intake, growth and digestibility in calves. *By Quigley et al., page 11016.* Calves fed a colostrum replacer followed by 2 feedings of milk replacer achieved lower levels of serum immunoglobulin G and reduced growth in the first 2 mo of life than calves fed 3 feedings of maternal colostrum. Differences in colostrum status and the amount of milk replacer fed affected growth and intake but did not affect nutrient digestibility at 1 and 3 wk of age.

<https://doi.org/10.3168/jds.2019-16682>.

Effects of supplementing rumen-protected lysine and methionine during prepartum and postpartum periods on performance of dairy cows. *By Lee et al., page 11026.* Limited information about feeding rumen-protected lysine (RPLys) and methionine (RPMet) to transition cows is available. Prepartum supplementation of RPLys and RPMet did not affect dry matter intake. Postpartum supply of RPLys and RPMet also did not affect dry matter intake, body weight, and blood metabolites. Although milk protein content increased for postpartum cows fed RPLys and RPMet, milk protein yield was not increased. During the carryover period (10 wk after treatments ceased) no production effects were observed for cows that had been fed RPLys and RPMet. However, prepartum sup-

ply of RPLys and RPMet decreased somatic cell counts during the fresh and early lactation period.

<https://doi.org/10.3168/jds.2019-17125>.

Effects of feeding different amounts of milk replacer on growth performance and nutrient digestibility in Holstein calves to 2 months of age using different weaning strategies. *By Klopp et al., page 11040.* From 0 to 2 mo of age, body weight and feed efficiency were greater for calves that received up to 1.1 kg of milk replacer powder compared with those that received up to 0.66 kg. However, starter intake was greater for calves receiving a moderate amount of milk replacer compared with a high amount and for calves that were weaned gradually rather than abruptly. Calves fed a moderate amount of milk replacer had increased neutral detergent fiber, acid detergent fiber, and sugar digestibility, whereas a high amount of milk replacer led to increased dry matter, organic matter, and fat digestibility.

<https://doi.org/10.3168/jds.2019-17153>.

Short communication: Effects of butyrate supplementation on productivity of lactating dairy cows fed diets differing in starch content. *By Izumi et al., page 11051.* Butyrate is used as a source of de novo fatty acid synthesis in the mammary gland, and butyrate supplementation in the diets of lactating dairy cows is expected to increase milk fat production. In the current study, butyrate was supplemented at 1.1% of dietary dry matter in diets differing in starch content (20.6 and 27.5%). We found that butyrate supplementation increased milk fat production and decreased milk urea nitrogen concentration, regardless of dietary starch content, without decreasing dry matter intake or increasing the risk of subclinical ketosis.

<https://doi.org/10.3168/jds.2019-17113>.

Short communication: Production performance and nutrient digestibility of lactating dairy cows fed diets with and without addition of a live-yeast supplement. *By Ferreira, page 11057.* Feeding live-yeast products may have beneficial effects on production performance, nutrient digestibility, or both. In this study, the effects of supplementing live yeast to lactating dairy cows were evaluated. In contrast to the hypothesis, feeding live yeast did not enhance production performance or nutrient digestibility. Evaluating an interaction between yeast and rumen buffer supplementation should be considered in future studies.

<https://doi.org/10.3168/jds.2019-17265>.

Technical note: Establishment of an ileal cannulation technique in preweaning calves and use of a piecewise regression approach to evaluate effects on growth and pH fluctuation of ileal digesta. *By Ansia et al., page 11061.* Collection of ileal

digesta samples is the best method to reliably measure digestibility of milk nutrients, especially protein. During this study, we established an ileal cannulation technique in young preruminant dairy calves to collect digesta samples during a regular milk-feeding program. The surgical procedure had minimal effects on growth and health. In addition, we evaluated the use of a nonlinear model to determine the effect of cannulation surgery on calf growth and to characterize daily fluctuations of digesta pH in the ileum.
<https://doi.org/10.3168/jds.2019-16788>.

High-density genome-wide association study for residual feed intake in Holstein dairy cattle. *By Li et al., page 11067.* We studied genome-wide associations of high-density genotypes with residual feed intake, using data from 4,823 lactations of 3,947 Holstein cows in US research herds. Residual feed intake appeared to be a highly polygenic trait regulated by many small effects. The top signals were in genetic regions previously associated with feed intake, energy balance, digestion and metabolism of carbohydrates and proteins, immunity, mitochondrial activities, rumen development, skeletal development, and spermatogenesis. The regions of 40.7 to 41.5 Mb on chromosome 25 and 57.7 to 58.2 Mb on chromosome 18 (UMD3.1 reference genome) were most closely associated with residual feed intake.
<https://doi.org/10.3168/jds.2019-16645>.

Inclusion of herdmate data improves genomic prediction for milk-production and feed-efficiency traits within North American dairy herds. *By Schultz et al., page 11081.* As more dairy farms adopt genomic selection practices, dairy producers will soon have genomic data available on all of the animals within their herds. Results from this study indicate incorporation of herdmate data into genomic predictions improves within-herd prediction accuracy. Such information could be used in herd-customized genomic improvement tools to aid dairy producers in breeding cattle that will perform well under the production strategy and management conditions present on their specific farms.
<https://doi.org/10.3168/jds.2019-16820>.

Genome-wide association study identifies loci influencing natural antibody titers in milk of Dutch Holstein-Friesian cattle. *By Cordero-Solorzano et al., page 11092.* Breeding for animals with improved health and finding the right traits are current challenges in dairy cattle. Natural antibodies are part of the innate immune system and may be useful to estimate an animal's potential immune competence. We found genomic regions associated with these antibodies in milk, which will help unravel the complex relationship between milk immunoglobulins and disease resistance in dairy cattle.
<https://doi.org/10.3168/jds.2019-16627>.

Haplotypes responsible for early embryonic lethality detected in Nordic Holsteins. *By Wu et al., page 11116.* Recessive lethal alleles in a homozygous state cause death of cattle and commonly manifest as early embryonic death. Using genomic data, we confirmed 2 known recessive lethal mutations, the brachyspina deletion and the missense variant in the *SMC2* gene (HH3), and identified 9 novel homozygous-deficient haplotypes that are putatively responsible for prenatal death in Nordic Holstein cattle. For 2 out of 9 homozygous-deficient haplotypes, insemination records of at-risk mating (carrier bull with the daughter of a carrier sire) showed reduced insemination success compared with other mating types, supporting early embryonic mortality.
<https://doi.org/10.3168/jds.2019-16651>.

Combining multi-population datasets for joint genome-wide association and meta-analyses: The case of bovine milk fat composition traits. *By Gebreyesus et al., page 11124.* Comparisons of genome-wide association study (GWAS) approaches have often been limited to simulation studies, mainly because “true effects” remain unknown in real data. This study presents an example where different data-combining strategies can be compared for detection power using real data based on previously validated QTL regions or genes, such as *DGAT1* and *SCD1* for milk composition traits. Milk fatty acid samples from Chinese, Danish, and Dutch Holsteins were used to undertake population-specific, combined-population GWAS as well as a meta-analysis. Results indicate that joint GWAS combining raw data is advantageous over meta-analysis combining summaries of individual GWAS.
<https://doi.org/10.3168/jds.2019-16676>.

Genomic prediction of serum biomarkers of health in early lactation. *By Luke et al., page 11142.* Improving dairy cattle health and resilience is vital for the long-term sustainability of the dairy industry. In this study, we estimated genetic parameters and the accuracy of genomic prediction of serum biomarkers that are commonly used to assess the health status of dairy cows in the 30-d period immediately after calving. Our results demonstrate that biomarkers of health are heritable, and that genomic selection for more optimal biomarker concentrations may be a way to breed healthier, more resilient dairy cows.
<https://doi.org/10.3168/jds.2019-17127>.

Prediction of effects of dairy selection indexes on methane emissions. *By Zhang et al., page 11153.* A recently developed method for determining the environmental impact of national breeding programs was applied to the New Zealand dairy industry. Genetic change in most traits considered was estimated to have an unfavorable effect on gross emissions per animal but

not on emissions intensity per unit of animal product or emissions per hectare. This suggests that novel selection criteria for reducing greenhouse gas emissions will be required if genetic improvement is to make a more substantial contribution to future reductions in New Zealand's national greenhouse gas inventory.
<https://doi.org/10.3168/jds.2019-16943>.

Energy profiling of dairy cows from routine milk mid-infrared analysis. *By Smith et al., page 11169.* The balance of body energy and body energy change in dairy cows is an important target for selection in holistic, modern breeding goals. This study uses dairy cow body energy traits to calibrate concurrent mid-infrared (MIR) spectral data and generate prediction tools for use in UK commercial dairy herds. Prediction equations for energy balance and intake were applied to a large milk MIR spectral data set. Energy trait predictions based on MIR spectra from routinely collected national data can be used in genetic improvement of livestock to obtain sustainable energy profiles.
<https://doi.org/10.3168/jds.2018-16112>.

Phenotypic and genetic analysis of milk and serum element concentrations in dairy cows. *By Denholm et al., page 11180.* Elements are essential dietary components in human health. Enhancing nutritious element concentrations within dairy cow milk and serum while ensuring that concentrations of toxic elements such as heavy metals are minimized is important for both the health of the cow and the nutritional value of her milk for human consumption. Our results suggest that element concentrations in dairy cow milk and serum are significantly influenced by both diet and genetics and that a combination of genetic selection and dietary manipulation could be used to alter such concentrations to improve both cow health and the healthfulness of milk for human consumption.
<https://doi.org/10.3168/jds.2019-16960>.

Joint imputation of whole-genome sequence variants and large chromosomal deletions in cattle. *By Mesbah-Uddin et al., page 11193.* Interest is growing in incorporating structural variants such as large chromosomal deletions (>50 bp) in population genetics studies and routine genomic evaluation for breeding of livestock. This requires large cohorts of animals with both structural variant genotypes and phenotypes. Here, we present a strategy for imputing large chromosomal deletion genotypes into the existing single nucleotide polymorphism (SNP) array-typed animals. The study was performed using the whole-genome sequenced animals from the 1,000 Bull Genomes Project and SNP array-typed animals from 3 Nordic dairy cattle breeds: Nordic Holstein, Danish Jersey, and Nordic Red Dairy Cattle.
<https://doi.org/10.3168/jds.2019-16946>.

Genetic parameters of endocrine fertility traits based on in-line milk progesterone profiles in Swedish Red and Holstein dairy cows. *By Tarekegn et al., page 11207.* Evaluating fertility traits based on endocrine progesterone profiles is becoming a promising option to improve dairy cow fertility. This study was conducted to estimate genetic parameters for classical and endocrine fertility traits in both Swedish Red and Holstein cows. The mixed linear animal model analysis showed a range of low to moderate heritability estimates for classical and endocrine fertility traits. For some endocrine traits, the heritability estimates were higher than for classical traits.
<https://doi.org/10.3168/jds.2019-16691>.

Genome-wide mapping of the dominance effects based on breed ancestry for semen traits in admixed Swiss Fleckvieh bulls. *By Khayatizadeh et al., page 11217.* In this study, we identified the breed origin of alleles at each locus along the genome using local genetic ancestry proportions in Swiss Fleckvieh cattle, a composite breed with Red Holstein Friesian and Swiss Simmental ancestries. To find regions potentially involved in heterosis, we mapped dominance effects based on breed ancestry for semen traits of purebred and admixed bulls.
<https://doi.org/10.3168/jds.2019-16899>.

Genetic parameters of colostrum traits in Holstein dairy cows. *By Soufleri et al., page 11225.* The genetic parameters of colostrum yield, fat, protein, lactose, total solids (% Brix values), and energy content were studied in Holstein dairy cows. Colostrum yield and quality traits were analyzed with univariate mixed models, including the fixed effects of several factors and the random animal additive genetic effect. The heritability estimates of colostrum quality traits suggest that genetic selection could be beneficial and offers interesting perspectives regarding calf health.
<https://doi.org/10.3168/jds.2019-17054>.

The effect of J5 bacterins on clinical, behavioral, and antibody response following an *Escherichia coli* intramammary challenge in dairy cows at peak lactation. *By Steele et al., page 11233.* In this study, we evaluated 2 J5 bacterins following induced *Escherichia coli* mastitis in dairy cows at peak lactation. We observed few differences between vaccinated and unvaccinated cows, except that vaccinated cows exhibited elevated temperatures 3 h earlier and spent more time lying per rest bout than controls following the intramammary challenge. Antibody concentrations differed between the 2 vaccinated groups, but this difference did not correspond to improved clinical outcomes. Our results suggest that the effects of J5 bacterins were diminished in cows at peak lactation.
<https://doi.org/10.3168/jds.2019-16549>.

Effect of prepartum exercise on lying behavior, labor length, and cortisol concentrations. *By Black and Krawczel, page 11250.* Holstein dairy cows were exercised, pastured, or confined for 1.5 h 5 times per week during the nonlactating period. Confined cows had fewer lying bouts and less overall lying time compared with pastured and exercised cows, suggesting more discomfort around calving. During calving, time from appearance of the amniotic sac to appearance of the calf's feet was longer for pastured cows. Cortisol concentrations were higher the day of calving compared with 3 d later, regardless of treatment. Understanding the effects of lying changes around calving and length of labor may lead to physical activity recommendations for late-gestation dairy cows.
<https://doi.org/10.3168/jds.2018-16029>.

Field study on bovine paratuberculosis using real-time PCR and liquid culture for testing environmental and individual fecal samples implemented in dairy cow management. *By Schwalm et al., page 11260.* This comparative field study includes testing of environmental and individual fecal samples for *Mycobacterium avium* ssp. *paratuberculosis* (MAP) based on real-time PCR and more sensitive cultivation of MAP in the liquid medium M7H9C. Both methods proved to be suitable to determine the MAP status of a herd in a first step and to test individual cows in a second step. This testing regimen has the advantage of fitting within the dry period of 6 to 8 wk and provides test results before calving, a prerequisite to prevent fecal-oral transmission to the newborn calf.
<https://doi.org/10.3168/jds.2018-15649>.

Efficacy of dairy on-farm high temperature, short time pasteurization of milk on the viability of *Mycobacterium avium* ssp. *paratuberculosis*. *By Fechner et al., page 11280.* To prevent transmission of pathogens, the pasteurization of colostrum or milk before feeding to calves is an increasingly popular practice for farmers. We evaluated the inactivation efficacy of a new on-farm, high-temperature, short-time pasteurizer on *Mycobacterium avium* ssp. *paratuberculosis* (MAP), the causative agent of Johne's disease (paratuberculosis), in milk. Inactivation of MAP improves herd health and economic output. Although we observed a reduction of viable MAP cells after pasteurization, transmission to calves through feeding of pasteurized milk or through distribution into the environment by the pasteurizer's washing water cannot be completely excluded.
<https://doi.org/10.3168/jds.2019-16590>.

Better recovery from lameness among dairy cows housed in hospital pens. *By Thomsen et al., page 11291.* Lameness may benefit from soft flooring, easy access to resources, and a smaller group size. This

may be accomplished through housing in a hospital pen. We compared recovery from lameness in 2 groups of lame cows: 1 group housed in hospital pens and 1 group housed together with their lactating herdmates. We found better recovery from lameness in cows housed in hospital pens. Housing of lame cows in hospital pens thus has the potential to improve both animal welfare and milk production.
<https://doi.org/10.3168/jds.2019-17045>.

Prediction of blood metabolites from milk mid-infrared spectra in early-lactation cows. *By Benedetto et al., page 11298.* Blood metabolic profile testing is a valid tool to detect and monitor metabolic diseases. The main purpose of this study was to use milk mid-infrared spectra routinely stored during test-day milk recording to predict some blood metabolites in dairy cows. Blood β -hydroxybutyrate was the most predictable metabolite, and it demonstrated promising ability to detect cows with elevated measured concentrations of this ketone body in blood. Moreover, milk mid-infrared spectra showed good performance in predicting other important blood metabolites, such as nonesterified fatty acids and urea.
<https://doi.org/10.3168/jds.2019-16937>.

Effects of recycled manure solids bedding on the spread of gastrointestinal parasites in the environment of dairies and milk. *By Lasprilla-Mantilla et al., page 11308.* The use of recycled manure solids as bedding for dairy cows has recently increased. However, information regarding the effects of this type of bedding on animals' health remains sparse. This study represents the first attempt to evaluate the parasite burden of zoonotic pathogens of animal and human importance in farms using recycled bedding. Our results demonstrate that protozoan parasites are not eliminated through the recycling process and show an elevated prevalence of zoonotic diarrheic pathogens in farms using recycled manure solids as bedding. This could lead to economic losses for farms, poorer animal well-being, and increased risk for public health.
<https://doi.org/10.3168/jds.2019-16866>.

Dairy producer perceptions of the Farmers Assuring Responsible Management (FARM) Animal Care Program. *By Rink et al., page 11317.* Dairy farms producing 98% of the US milk supply follow guidelines outlined in the Farmers Assuring Responsible Management (FARM) Animal Care Program. Producers who sell milk to cooperatives or processors participating in FARM must follow standards defined by the program. This study assessed dairy producer perceptions of the program through a survey instrument. Most participants were knowledgeable about the FARM program and desired more input when revising the program. Less than half of participants felt that the

program was valuable. Results from this study can be used to continually improve the program and inform future versions.

<https://doi.org/10.3168/jds.2019-16859>.

Cows with paratuberculosis (Johne's disease) alter their lying behavior around peak lactation.

By Charlton et al., page 11328. Paratuberculosis or Johne's disease (JD) is a chronic, highly contagious infection of ruminants that is difficult to detect and control. Changes in animal behavior can indicate disease or illness, yet no studies have investigated the behavior of cows with JD. The objective of this study was to compare the behavioral activity of JD-positive cows to JD-negative cows. The JD-positive cows spent less time lying down during peak lactation, and had fewer lying bouts compared with JD-negative cows. Lying behavior may be useful to detect cows with JD, although further research is required.

<https://doi.org/10.3168/jds.2019-16854>.

Comparison of oral, intravenous, and subcutaneous fluid therapy for resuscitation of calves with diarrhea.

By Doré et al., page 11337. Neonatal diarrhea continues to be the leading cause of dairy calf mortality around the world. The major goals of treatment are to correct dehydration, increase blood pH, restore electrolyte concentrations, and provide nutritional support. In this study, we compared the ability of a commercially available oral electrolyte solution alone or in combination with hypertonic saline compared with the administration of small volumes of intravenous or subcutaneous fluid therapy to resuscitate calves with osmotic diarrhea.

<https://doi.org/10.3168/jds.2019-16970>.

Dynamics of somatic cell count patterns as a proxy for transmission of mastitis pathogens.

By Dalen et al., page 11349. Real-time detection and management of transmission of subclinical intramammary infection (IMI) may improve management of udder health. The DeLaval Online Cell counter (DeLaval, Tumba, Sweden) can be used to identify cows with subclinical and clinical mastitis. The current investigation evaluated the transmission dynamics of mastitis pathogens and, as a proxy, online cell count patterns associated with subclinical IMI. The pattern of transmission dynamics associated with cell counts was found to be useful at different levels of specificity for surveillance of subclinical IMI during lactation.

<https://doi.org/10.3168/jds.2019-16847>.

Effect of antibiotic treatment in preweaned Holstein calves after experimental bacterial challenge with *Pasteurella multocida*. *By Holschbach et al., page 11359.* This study measured the effect of 3-d ampicillin treatment on induced respiratory disease

in preweaned Holstein calves. Lung ultrasound, clinical respiratory scoring, and postmortem examination were used to quantify outcomes. Treatment improved lung health in the short term. Future studies are needed to optimize treatment strategies to improve long-term lung health.

<https://doi.org/10.3168/jds.2019-16992>.

Measurement of urine pH and net acid excretion and their association with urine calcium excretion in periparturient dairy cows.

By Constable et al., page 11370. The main objectives of this study were to determine the relationship between urine pH, net acid excretion, urine Ca concentration, and urine pH measured by the Multistix-SG urine dipstick (Siemens Medical Solutions Inc., Ann Arbor, MI) and Hydrion pH paper (Micro Essential Laboratory Inc., Brooklyn, NY) in dairy cows. We found that both urine pH and net acid excretion provided a clinically useful insight into urine Ca concentration and systemic acid-base status in dairy cows, and that urine dipstick and pH paper were sufficiently accurate methods for measuring urine pH.

<https://doi.org/10.3168/jds.2019-16805>.

Cross-sectional study of the relationship among bedding materials, bedding bacteria counts, and intramammary infection in late-lactation dairy cows.

By Rowe et al., page 11384. We investigated the prevalence of and bedding-related risk factors for intramammary infection (IMI) in cows approaching dry-off (>180 d pregnant). Our findings indicated that quarter-level IMI prevalence is low in US dairy herds (21.1%), which suggests that selective dry cow therapy may be appropriate for many herds. We also found that bedding material type was not an important risk factor for IMI, but that high bacteria counts in bedding may increase IMI risk in late-lactation cows.

<https://doi.org/10.3168/jds.2019-17074>.

Cross-sectional study of the relationship between cloth udder towel management, towel bacteria counts, and intramammary infection in late-lactation dairy cows.

By Rowe et al., page 11401. We investigated cloth udder towel-related risk factors for intramammary infection (IMI) in cows approaching dry-off (>180 d pregnant). We found a positive association between levels of *Staphylococcus* spp., *Streptococcus* spp., and *Streptococcus*-like organisms in towels and IMI caused by those pathogens. These findings indicated that cloth udder towels may function as a mechanism for transfer of IMI-causing pathogens.

<https://doi.org/10.3168/jds.2019-17075>.

Lameness during the dry period: Epidemiology and associated factors. *By Daros et al., page 11414.* Lameness is one of the greatest challenges in the dairy

industry. Longitudinal studies allow us to detect the development of new cases of lameness. In this study, we analyzed gait scores of 455 cows during the 2 mo before calving (i.e., the dry period) and in early lactation to assess the dynamics of lameness and its associated factors. A high proportion of new lameness cases were observed during the dry period. Lameness during the dry period was associated with lameness in early lactation. Hoof-trimming before dry-off was associated with prevention of new cases of lameness for primiparous but not for multiparous cows.
<https://doi.org/10.3168/jds.2019-16741>.

Serum calcium dynamics within the first 3 days in milk and the associated risk of acute puerperal metritis. *By Venjakob et al., page 11428.* The objectives of this study were to evaluate postpartum serum calcium dynamics for different parity groups of dairy cows and to evaluate the association between serum calcium concentration on d 0, 1, and 3 postpartum and the risk of developing acute puerperal metritis. The nadir of serum calcium concentration occurred on d 1 and 3 after calving in multiparous and primiparous cows, respectively. Our study revealed an association between hypocalcemia on d 3 and acute puerperal metritis. Primiparous cows with low serum calcium concentration had the highest predicted probability of developing acute puerperal metritis.
<https://doi.org/10.3168/jds.2019-16721>.

Short communication: Selection of extended-spectrum β -lactamase-producing *Escherichia coli* in dairy calves associated with antibiotic dry cow therapy—A cohort study. *By Tetens et al., page 11449.* Multidrug-resistant bacteria are an increasing problem and of great importance for public health. In this context, antimicrobial residues in milk are discussed as a possible selector for *Enterobacteriaceae* that produce extended-spectrum β -lactamases (ESBL). Waste milk contains antibiotic residues after treatment of mastitis, but our data suggest that antibiotic dry cow therapy might also lead to antibiotic residues in colostrum and in milk during early lactation. Selective dry cow therapy was associated with significantly reduced concentrations of ESBL-producing *Enterobacteriaceae* in feces of calves compared with blanket dry cow therapy.
<https://doi.org/10.3168/jds.2019-16659>.

Short communication: Effects of mammary biopsy in the dry period on activity and feeding behavior of dairy cows. *By Miller-Cushon et al., page 11453.* Mammary biopsies are a common approach to measuring mammary gland development in dairy cows. We investigated effects of mammary biopsy on activity and feeding behavior following the procedure. We did not find an effect of mammary biopsy on feed intake, feeding time, or lying time. However, the biopsy

procedure caused more frequent, shorter lying bouts, particularly on the biopsied side, and more frequent, shorter meals on the first day post-biopsy compared with unbiopsied cows. These behavioral changes may reflect increased restlessness or specific pain in the biopsied quarter, suggesting possible welfare consequences and benefits of evaluating providing analgesics during recovery.
<https://doi.org/10.3168/jds.2019-17007>.

Short communication: Detection of antibiotic resistance, *mecA*, and virulence genes in coagulase negative *Staphylococcus* spp. from buffalo milk and the milking environment. *By MacInnes et al., page 11459.* Although coagulase-negative strains may not be a significant mastitis or subclinical mastitis causing agents in buffaloes, they may be a reservoir of virulence genes and antibiotic resistance
<https://doi.org/10.3168/jds.2018-15920>.

Short communication: Determination of the milk pharmacokinetics and depletion of milk residues of flunixin following transdermal administration to lactating Holstein cows. *By Gorden et al., page 11465.* Flunixin is a nonsteroidal anti-inflammatory drug that was recently approved as a transdermal formulation for use on cattle in the United States. A study was conducted to determine the pharmacokinetics in milk of dairy cows treated with transdermal flunixin and determine an appropriate withdrawal time for milk. Ten lactating Holstein cows were treated with transdermal flunixin during mid-lactation and then milk and blood samples were collected for drug analysis. Using a statistical tolerance limit procedure, calculations to approximate a withdrawal time in milk following transdermal flunixin administration indicated that a period of 96 h should be observed following the last treatment to avoid violative residues in milk.
<https://doi.org/10.3168/jds.2019-16639>.

Short communication: Longitudinal study of quarter-level somatic cell responses after naturally occurring, nonsevere clinical mastitis diagnosed as culture negative, or caused by *Escherichia coli* or *Klebsiella pneumoniae*, and randomly assigned to a no-treatment group or to receive intramammary ceftiofur. *By Fuenzalida and Ruegg, page 11476.* Few data are available describing pathogen specific quarter-level inflammatory responses after intramammary infection. This study analyzed quarter-level somatic cell count after occurrence of clinical mastitis diagnosed as culture negative, or caused by *Escherichia coli* or *Klebsiella pneumoniae*. Results indicate that regardless of treatment, quarter somatic cell count varied by pathogen and was least for cases caused by *E. coli* or diagnosed as culture negative as compared with cases caused by *Kleb. pneumoniae*.
<https://doi.org/10.3168/jds.2018-16190>.

Technical note: A novel approach to estimate dry matter intake of lactating dairy cows through multiple on-cow accelerometers. *By Carpinelli et al., page 11483.* Dry matter intake (DMI) is a fundamental parameter in dairy cattle nutrition research and management because it allows estimation of the overall supply of nutrients ingested by the animal and the ability of the animal to transform those nutrients into milk (i.e., feed efficiency). In this study, we put forth a novel approach to estimate DMI by fixing multiple 3-dimensional (i.e., x-, y-, and z-axes) accelerometer sensors on the cow (3 accelerometers on leg, nose, and jaw). Our data revealed that this multiple accelerometer approach has great potential to determine DMI with a certain degree of accuracy, and further studies with greater samples size will improve the ability of this approach to account for animal variation.
<https://doi.org/10.3168/jds.2019-16537>.

Validation of a novel milk progesterone-based tool to monitor luteolysis in dairy cows: Timing of the alerts and robustness against missing values. *By Adriaens et al., page 11491.* In this study, we validated the performance of 2 monitoring algorithms to detect luteolysis using milk progesterone measurements on a simulated data set of realistic milk progesterone profiles. The synergistic control-based algorithm, PMASC, was able to identify luteolysis almost simultaneously with its occurrence. It was found to be more robust against missing samples and less dependent on the absolute milk progesterone values compared with a multiprocess Kalman filter combined with a fixed threshold. This research showed that implementation of PMASC could improve progesterone-based fertility monitoring on farm.
<https://doi.org/10.3168/jds.2019-16405>.

A goal programming approach for balancing diet costs and feed water use under different environmental conditions. *By Qu et al., page 11504.* A goal programming model was developed to serve as an optimization framework to achieve a balance between minimization of dietary costs and dietary irrigation water usage under different environmental scenarios in dairy production and other livestock production systems. The environmental conditions in this study used a $2 \times 2 \times 2$ factorial design, including 2 CO₂ levels, 2 water years (dry and wet), and 2 irrigation methods. A set of unique solutions was generated, with each solution including a different water usage and feeding option according to diet cost, water usage, and available feeds.
<https://doi.org/10.3168/jds.2019-16543>.

A quantitative case study assessment of biophysical and economic effects from altering season of calving in temperate pasture-based dairy

systems. *By Spaans et al., page 11523.* Traditionally, pasture-based systems have been managed to begin calving during winter so that maximum and minimum pasture dry matter supply coincide with maximum and minimum herd dry matter demand, respectively. We evaluated the effects of calving in January, April, July, or October on biophysical and financial performance with or without a premium for milk in late autumn and winter. Pasture growth and quality profiles best matched herd demand in the July (late winter) calving treatment, resulting in a tendency for greater milk production per cow and per hectare. As a result, gross revenue and operating profit were greater regardless of whether a realistic winter milk price premium was available.
<https://doi.org/10.3168/jds.2018-15911>.

Melatonin administration during the dry period stimulates subsequent milk yield and weight gain of the offspring in subtropical does kidding in summer. *By Avilés et al., page 11536.* Administration of melatonin implants (that mimic short days) in dairy cows during the dry period did not stimulate the subsequent milk yield as did exposure to short days. However, to date, this possibility has not been studied in goats that suckle their kids. The present results show that the melatonin implants to pregnant goats during the dry period increased the milk yield in the subsequent lactation and in turn increased the mean daily weight gain of their offspring. We concluded that the administration of melatonin that mimics the short-day photoperiod during the dry period stimulates lactation in goats.
<https://doi.org/10.3168/jds.2019-16836>.

Mammalian target of rapamycin signaling and ubiquitin-proteasome-related gene expression in skeletal muscle of dairy cows with high or normal body condition score around calving. *By Ghaffari et al., page 11544.* The regulation of muscle protein turnover during a period of negative nutrient balance needs to be better understood. The objective of this study was to elucidate the effect of body condition around calving on the mRNA abundance of critical components of the mammalian target of rapamycin pathway and ubiquitin-proteasome system in the skeletal muscle (semitendinosus) of dairy cows. The findings from the current study revealed that overconditioning around calving might stimulate muscle protein turnover in early lactation, as indicated by the changes in the mRNA abundance of key components of mammalian target of rapamycin signaling and the ubiquitin-proteasome system.
<https://doi.org/10.3168/jds.2019-17130>.

Metabolomics meets machine learning: Longitudinal metabolite profiling in serum of normal versus overconditioned cows and pathway

analysis. *By Ghaffari et al., page 11561.* Cows that are inadequately managed during late lactation may reach high body condition, which in turn increases the risk for diseases. This situation was modeled in 18 cows that were compared with 18 cows of normal body condition in terms of metabolic profiles recorded at d -49, 3, 21, and 84 relative to calving by means of a targeted metabolic approach that comprised 180 metabolites out of 6 compound classes. Using various machine learning algorithms and pathway analyses, the degradation of branched-chain amino acids before calving and mitochondrial β -oxidation after calving were identified as being most associated with overconditioning. <https://doi.org/10.3168/jds.2019-17114>.

Fibroblast growth factor-21 (FGF21) administration to early-lactating dairy cows. I. Effects on signaling and indices of insulin action. *By Krumm et al., page 11586.* The hormone fibroblast growth factor-21 (FGF21) is elevated in early lactating dairy cows. In rodents, this hormone promotes insulin action by acting on liver and adipose tissue and by increasing plasma adiponectin, but it is unknown whether it acts similarly in dairy cows. Administration of human FGF21 to early lactating cows triggered signaling only in adipose tissue and did not have any effect on indices of insulin action or on plasma adiponectin. Fibroblast growth factor-21 does not act as an insulin sensitizer in early-lactating, energy-deficient cows, but this role remains possible in other physiological states. <https://doi.org/10.3168/jds.2019-16695>.

Fibroblast growth factor-21 (FGF21) administration to early-lactating dairy cows. II. Pharmacokinetics, whole-animal performance, and lipid metabolism. *By Caixeta et al., page 11597.* The accelerated fatty acid mobilization of early lactation often results in excessive lipid accumulation in the liver. The newly described hormone fibroblast growth factor-21 (FGF21) prevents this condition in mice experiencing increased hepatic fatty acid flux, but whether it exerts similar protective effects in dairy cattle was unknown. Chronic administration of human FGF21 to early-lactating cows reduced liver triglyceride levels by 50% without negative effects on appetite, milk yield, or estimated energy balance. A portion of the effect of FGF21 on liver triglyceride could be due to a reduction of the hepatic influx of adipose tissue-derived fatty acids. <https://doi.org/10.3168/jds.2019-16696>.

Associations between body condition score at parturition and microRNA profile in colostrum of dairy cows as evaluated by paired mapping programs. *By Ylloja et al., page 11609.* MicroRNAs, a class of noncoding RNA that can regulate physiological

function, are abundant in milk. This study sought to determine whether degree of adiposity of dairy cows at the time of calving affects the microRNA profile in colostrum, which could potentially influence calf immune function. Few differences were detected between moderate and high body condition groups, but the microRNAs that were present have potential to regulate mammary function as well as calf development. <https://doi.org/10.3168/jds.2019-16675>.

Anti-Müllerian hormone in grazing dairy cows: Identification of factors affecting plasma concentration, relationship with phenotypic fertility, and genome-wide associations. *By Gobikrushanth et al., page 11622.* In this study, plasma anti-Müllerian hormone (AMH) concentration was highly variable, and part of the variation in AMH was influenced by cow breed, parity, and day of estrous cycle. A smaller proportion of cows with low plasma AMH became pregnant by the end of the breeding season compared with cows with intermediate or high plasma AMH. Heritability for plasma AMH was moderate, and 68 single nucleotide polymorphisms across *Bos taurus* autosomes 7 and 11 were associated with phenotypic variation in plasma AMH. <https://doi.org/10.3168/jds.2019-16979>.

Neutrophil β -defensin gene expression of postpartum dairy cows is altered by prepartum dietary cation-anion difference. *By Merriman et al., page 11636.* Feeding acidogenic salts to create a negative dietary cation-anion difference (DCAD) is an effective strategy to prevent hypocalcemia and improve health and production of dairy cows. Here, we report that feeding a prepartum ration with a negative DCAD increased neutrophil β -defensin gene expression compared with feeding a positive DCAD. Furthermore, neutrophils of cows that experienced postpartum subclinical hypocalcemia, retained placenta, or metritis had decreased β -defensin expression compared with healthy cows. <https://doi.org/10.3168/jds.2019-17216>.

Multicolor flow cytometric analysis of cryopreserved bovine sperm: A tool for the evaluation of bull fertility. *By Bucher et al., page 11652.* Flow cytometry is a laser-based method used to analyze the physical and chemical characteristics of cells after fluorescent labeling. For the first time, we report the combined use of 5 fluorochromes for assessing equal functional features in cryopreserved sperm obtained from bulls of diverse fertility. The targeted features were related to the ability of sperm to maintain the integrity of their plasma and acrosomal membrane, and to regulate their intracellular Ca^{2+} levels and mitochondrial activity. Our study revealed a remarkable heterogeneity

of sperm functional status and highlighted the combination of characteristics with the highest importance for evaluating bull fertility.

<https://doi.org/10.3168/jds.2019-16572>.

Efficacy of cabergoline in a double-blind randomized clinical trial on milk leakage reduction at drying-off and new intramammary infections across the dry period and postcalving.

By Hop et al., page 11670. Abrupt cessation of milking at drying-off may induce milk leakage, which may increase the risk of new intramammary infections (IMI). We assessed the efficacy of one intramuscular injection of cabergoline at drying-off on milk leakage and new IMI across the dry period and postcalving. Data were gathered from 63 farms in France, Germany, and Hungary. This double-blind clinical trial comparing cabergoline, placebo, and antibiotic proved that cabergoline reduced significantly the incidence of milk leakage and, consequently, decreased the risk of new IMI. Thus, cabergoline can be a useful tool to dry off cows in situations where antibiotics are not permitted.

<https://doi.org/10.3168/jds.2019-16281>.

Effects of dietary zinc source on the metabolic and immunological response to lipopolysaccharide in lactating Holstein dairy cows.

By Horst et al., page 11681. Compromised epithelial barriers allow for bacterial infiltration into portal and systemic circulation. Leukocyte recognition of bacterial components initiates an immune response, and this decreases energy available for productive purposes. Zinc improves epithelial barrier integrity and leukocyte function. Therefore, the objectives of this study were to investigate the effects of supplemental zinc amino acid complex on immune system dynamics and function following an intravenous endotoxin challenge.

<https://doi.org/10.3168/jds.2019-17037>.

Long-term effects of postpartum clinical disease on milk production, reproduction, and culling of dairy cows.

By Carvalho et al., page 11701. Two retrospective studies examining data of 7,500 lactating dairy cows showed that 23 to 30% had at least 1 clinical disease during the first 21 d postpartum, and those affected had reduced lactation and reproductive performance through 305 d of lactation. Despite similar genetic merit, 305-d yield of milk was substantially reduced in cows that had disease. Moreover, cows diagnosed with clinical disease had reduced pregnancy rates, higher numbers of pregnancy losses, and higher culling rates than those without such a diagnosis. Multiple clinical cases had additive consequences on performance and survival. Results indicate that detrimental consequences of early postpartum disease are extended for months after clinical resolution.

<https://doi.org/10.3168/jds.2019-17025>.

Insulin signaling and insulin response in subcutaneous and retroperitoneal adipose tissue in Holstein cows during the periparturient period.

By Kenéz et al., page 11718. Adipose tissues highly contribute to endocrine and metabolic regulation of dairy cows during the period around parturition. Retroperitoneal adipose tissue, as part of the visceral fat depots, was identified as a major contributor to insulin-dependent regulation of energy sensing and lipolytic adaptation. From a mechanistic point of view, molecular markers suggest that differential activation of receptor and enzyme proteins are involved in driving the mentioned adaptation processes as well as in the uneven metabolic features of retroperitoneal and subcutaneous adipose tissue.

<https://doi.org/10.3168/jds.2019-16873>.

Short communication: Reproduction outcomes in dairy heifers following a 14-d progesterone insert presynchronization protocol.

By Claypool et al., page 11730. Presynchronization of estrus is a common strategy in lactating cows, but not heifers, to increase synchrony of estrus and fertility. The objective was to evaluate reproductive performance of heifers subjected to presynchronization compared with those not presynchronized. Treatment with a 14-d controlled internal drug release insert containing progesterone effectively presynchronized estrus, reduced days to first artificial insemination, and resulted in an increased proportion pregnant within the first 7 d of eligibility compared with a single prostaglandin F_{2α} presynchronization injection and control (no presynchronization).

<https://doi.org/10.3168/jds.2019-17000>.

Short communication: Ketosis, feed restriction, and an endotoxin challenge do not affect circulating serotonin in lactating dairy cows.

By Horst et al., page 11736. The periparturient period is characterized by substantial metabolic changes involving normal homeostatic adaptations to support milk production. Maladaptation to these changes increases the risk of disease and negatively affects farm profitability. Serotonin has gained considerable attention for its apparent effect on energy balance and calcium homeostasis during lactogenesis. Thus, we hypothesized that models of severe energetic and mineral perturbation would alter circulating serotonin (5-HT) in lactating Holstein cows. In contrast to expectations, circulating 5-HT was unaffected by metabolic and calcium dyshomeostasis. Further, 5-HT was not correlated with circulating nonesterified fatty acids, β-hydroxybutyrate, or ionized calcium.

<https://doi.org/10.3168/jds.2019-17105>.

Technical note: Rapid field test for the quantification of vitamin E, β-carotene, and vitamin A in whole blood and plasma of dairy cattle.

By

Ghaffari et al., page 11744. The blood concentration of fat-soluble vitamins such as vitamin E, β -carotene, and vitamin A can be used to assess the status of these vitamins in dairy cattle. However, determination of these blood components requires time-consuming, multistep, labor-intensive procedures. In this study, we evaluated a new rapid field-portable test (iCheck; BioAnalyt GmbH, Teltow, Germany) for cow-side quantification of vitamin E, β -carotene, and vitamin A in the whole blood of dairy cattle. We compared the results obtained with high-performance liquid chromatography in plasma using corresponding samples from dairy cows ($n = 28$) and calves ($n = 11$). The results were in very good accordance and demonstrated that vitamin E, β -carotene, and vitamin A can be determined easily and rapidly in whole blood using the iCheck rapid test. <https://doi.org/10.3168/jds.2019-16755>.

Persistence of differences between dairy cows categorized as low or high methane emitters, as estimated from milk mid-infrared spectra and measured by GreenFeed. *By Denninger et al., page 11751.* An existing equation based on milk mid-infrared spectra was used to retrospectively group 20 dairy cows as 10 low and 10 high methane emitters. GreenFeed (C-Lock Technology Inc., Rapid City, SD) was used to validate estimates. Cows were investigated over a 5-mo period that covered grazing and indoors feeding periods. Differences between high- and low-emitting groups persisted, and monthly control intervals were found to provide sufficient confirmatory findings. A shortcoming of this study was the weak correlation of mid-infrared and GreenFeed methane emission data in individual cows. <https://doi.org/10.3168/jds.2019-16804>.

Methane emissions of manure from dairy cows fed red clover- or corn silage-based diets supplemented with linseed oil. *By Hassanat and Benchaar, page 11766.* This study examined the effects of forage source (red clover silage versus corn silage) and linseed oil supplementation (4% of dietary dry matter) in

dairy cow diets on methane emissions from anaerobic incubation (17 weeks) of manure. Maximum methane production potential (liters per kilogram of volatile solids excreted) was higher for cows fed corn silage-based diets compared with cows fed red clover silage-based diets. Maximum methane production potential increased with the addition of linseed oil to the diets. Results of this study show that source of forage in the basal diet and dietary fat supplementation can influence methane emissions from manure and this should be taken into consideration when such strategies are recommended to mitigate enteric methane production from dairy cows. <https://doi.org/10.3168/jds.2018-16014>.

Comparing dairy farm milk yield and components, somatic cell score, and reproductive performance among United States regions using summer to winter ratios. *By Guinn et al., page 11777.* The objective of this research was to explore the usefulness of a metric called the summer to winter performance ratio, which is used to quantify performance changes during heat stress. Monthly performance data obtained by the Dairy Herd Improvement Association (DHIA) from 2007 to 2016 for all US DHIA herds processing records through Dairy Records Management Systems (Raleigh, NC) were used in the analyses. Differences were observed in summer to winter ratios among regions for energy-corrected milk, somatic cell score, milk fat and protein percentage, conception rate, heat detection rate, and pregnancy rate. Results identified negative responses to heat stress among varying regions of the United States. <https://doi.org/10.3168/jds.2018-16170>.

Symposium review: Predicting pregnancy loss in dairy cattle. *By Ealy and Seekford, page 11798.* This short review describes the various technologies being tested in dairy cattle to identify cows at risk for embryo mortality. Identifying markers of pregnancy loss will allow development of strategies to reduce these losses, thus offering producers opportunities to reduce costs. <https://doi.org/10.3168/jds.2019-17176>.