

INTERPRETIVE SUMMARIES, AUGUST 2017

Invited review: Inbreeding in the genomics era: Inbreeding, inbreeding depression, and management of genomic variability. *By Howard et al., page 6009.* Genomic information is routinely utilized in dairy populations and has dramatically changed dairy cattle breeding. The review paper explores topics related to inbreeding, measures of relatedness, genetic diversity, and methods for managing populations at the genomic level, and we discuss future challenges related to managing populations through implementing genomic methods at the herd and population levels. <https://doi.org/10.3168/jds.2017-12787>.

Antioxidant status and gut microbiota change in an aging mouse model as influenced by exopolysaccharide produced by *Lactobacillus plantarum* YW11 isolated from Tibetan kefir. *By Zhang et al., page 6025.* This study provided data about the capability of antioxidative exopolysaccharide produced by *Lactobacillus plantarum* YW11 to improve the antioxidant status in aging mice, in which oxidative stress was induced with D-galactose. The administration of exopolysaccharide was found to recover the diversity and abundance of gut microbiota in the aging mice model, thereby relieving the oxidative status in aging mice. Therefore, exopolysaccharide from *L. plantarum* YW11 may potentially serve as a nutritional supplement for improving the antioxidant status of humans. <https://doi.org/10.3168/jds.2016-12480>.

Effect of pasture versus indoor feeding systems on quality characteristics, nutritional composition, and sensory and volatile properties of full-fat Cheddar cheese. *By O'Callaghan et al., page 6053.* There is currently a consumer perception that dairy products from cows on pasture have more health benefits than dairy products from cows on conventional total mixed ration indoor feeding systems. Cheddar cheese is a highly consumed dairy food; therefore, improving the nutrient composition of Cheddar cheeses could be very beneficial to the consumer's overall diet and health. This study provides a comprehensive comparison of the effects of different pasture and indoor feeding systems on the nutritional composition, quality, and volatile and sensory properties of Cheddar cheese throughout ripening. <https://doi.org/10.3168/jds.2016-12508>.

Crystallization and demineralization phenomena in stabilized white mold cheese. *By Tansman et al., page 6074.* Although extensive work has investigated the effect of crystallization on traditional white mold cheeses, this research has not been applied to stabilized varieties. This report documents a crystallization phenomenon in the rind of stabilized white

mold cheese and links this phenomenon to the accumulation of mineral elements in the rind and concurrent withdrawal of mineral elements from the center of the cheese. Given the importance of mineral elements in cheese structure development, this study provides insights about stabilized ripening processes and indicates an important homology between traditional and stabilized white mold cheeses. <https://doi.org/10.3168/jds.2016-12259>.

Technical note: At-line prediction of mineral composition of fresh cheeses using near-infrared technologies. *By Manuelian et al., page 6084.* This study aimed to predict the mineral content of fresh cheeses using near-infrared reflectance and transmittance spectroscopy. Dairy products are important sources of minerals for human nutrition. The mineral content of fresh cheeses is low, which may hamper its prediction. Our results showed that near-infrared reflectance and transmittance spectroscopy performed similarly, but none of the prediction models were accurate enough to replace current reference analysis. <https://doi.org/10.3168/jds.2017-12634>.

Drivers of choice for fluid milk versus plant-based alternatives: What are consumer perceptions of fluid milk? *By McCarthy et al., page 6125.* Milk consumption has declined, whereas nondairy alternatives have seen growth in sales. It is necessary to gain a better understanding of what drives purchase and what product features of fluid milk are most appealing to consumers. This study establishes what attributes are most attractive and what values drive the purchase of fluid milk and plant-based alternatives for different consumer groups. <https://doi.org/10.3168/jds.2016-12519>.

Addition of glycerol to lactating cow diets stimulates dry matter intake and milk protein yield to a greater extent than addition of corn grain. *By Bajramaj et al., page 6139.* Biodiesel manufacture results in co-production of glycerol, which, as a feedstuff for dairy cows, has several features in common with grains. To compare effects on lactation performance of corn and glycerol, cows were fed a high-forage basal diet to which either corn or refined glycerol were added to increase energy density equally. Both corn and glycerol stimulated milk protein production, but glycerol had a larger effect. Glycerol also decreased milk fat production. The larger effects on milk component yields of glycerol compared with corn were taken to indicate that glycerol allows for higher glucose production by the cow. <https://doi.org/10.3168/jds.2016-12380>.

Inclusion of wheat and triticale silage in the diet of lactating dairy cows. *By Harper et al., page 6151.* We used cover crop wheat or triticale silage, harvested at the boot stage, to replace a portion of corn silage dry matter in the diet of lactating dairy cows. Dry matter intake was not affected, whereas both cover crop silages decreased milk yield by an average of 1.4 kg/d. This experiment demonstrates that diets containing wheat and triticale silage can support milk production above 41 kg/d, but addition of concentrate feeds may be necessary to achieve production equal to that of corn silage.

<https://doi.org/10.3168/jds.2017-12553>.

Use of milk fatty acids to estimate plasma nonesterified fatty acid concentrations as an indicator of animal energy balance. *By Dórea et al., page 6164.* Negative energy balance is an important part of the lactation cycle, and measuring the current energy balance of a cow is useful in both applied and research settings. Milk fatty acids were previously related to energy balance of dairy cattle. Data from 3 studies were used to evaluate the ability of milk fatty acids to predict plasma concentrations of nonesterified fatty acids as an indicator of energy balance. Compared with individual fatty acid proportions, ratios of C18:1 to C14:0, C18:1 to C15:0, and C17:0 to C15:0 were the most accurate predictors of plasma nonesterified fatty acids, suggesting that they may have utility on farm.

<https://doi.org/10.3168/jds.2016-12466>.

Effects of partial replacement of corn grain with lactose in calf starters on ruminal fermentation and growth performance. *By Saegusa et al., page 6177.* It was hypothesized that feeding lactose as a partial replacement of starch in calf starters would mitigate subacute ruminal acidosis and improve animal performance. In the current study, inclusion of lactose in calf starters did not affect calf starter intake, growth performance, or incidence of diarrhea but did increase ruminal concentration of acetate instead of butyrate. However, we found that intake of lactose and hay was positively correlated to ruminal pH.

<https://doi.org/10.3168/jds.2017-12616>.

In vitro response to EPA, DPA, and DHA: Comparison of effects on ruminal fermentation and biohydrogenation of 18-carbon fatty acids in cows and ewes. *By Toral et al., page 6187.* Marine lipid supplements rich in n-3 polyunsaturated fatty acids can modulate ruminal biohydrogenation and, consequently, milk fatty acid profile. In this work, we compared in vitro ruminal responses to 20:5n-3, 22:5n-3, and 22:6n-3 in cows and ewes. We observed that 20:5n-3 and 22:6n-3 were equally effective in inhibiting *trans*-11 18:1 saturation but that 22:6n-3 further

promoted alternative biohydrogenation pathways. The contribution of 22:5n-3 to the effects of marine lipids was suggested to be minor. Although most changes seemed comparable in bovines and ovines, certain responses were inherent to each ruminant species.

<https://doi.org/10.3168/jds.2017-12638>.

Effects of shortening the close-up period length coupled with increased supply of metabolizable protein on performance and metabolic status of multiparous Holstein cows. *By Amirabadi Farahani et al., page 6199.* During the last week of gestation, dairy cows experience a dramatic decrease in dry matter intake, which compromises nutrient balance.

Therefore, improving dry matter intake during this period could beneficially affect health and postpartum performance. The present paper aimed to evaluate the effects of a shortened close-up period combined with feeding different metabolizable protein levels on the performance and metabolic status of dairy cows. Our results indicated that multiparous cows will benefit from a shortened close-up period and that feeding a moderate metabolizable protein diet (101 g/kg of dry matter) during the close-up period could improve performance and metabolic status of periparturient cows.

<https://doi.org/10.3168/jds.2016-12263>.

Effect of partitioning the nonfiber carbohydrate fraction and neutral detergent fiber method on digestibility of carbohydrates by dairy cows. *By Tebbe et al., page 6218.* Summative equations partition feeds into fractions and multiply the concentrations

by their true digestibility to estimate energy values. Neutral detergent fiber and nonfiber carbohydrates are used in many equations, but both fractions are heterogeneous, and their concentrations and digestibility depend on whether neutral detergent fiber is expressed on an ash- and protein-free basis. We partitioned nonfiber carbohydrates into starch and residual organic matter. The residual organic matter was a uniform fraction with a high true digestibility. The effect of adjusting for contamination of fiber by ash and protein was generally small. Separating nonfiber carbohydrates into starch and residual organic matter may improve accuracy of estimating energy of diets.

<https://doi.org/10.3168/jds.2017-12719>.

Effect of dietary quebracho tannin extract on milk fatty acid composition in cows. *By Henke et al., page 6229.* We evaluated the capacity of quebracho tannin extract to modulate ruminal biohydrogenation of polyunsaturated fatty acids in the milk of cows. Addition of quebracho tannins to the diet enhanced proportions of linoleic acid and α -linolenic acid—seen as potentially promoting health in human nutrition—in milk fat. Moreover, total polyunsaturated and long-

chain fatty acids were increased, whereas myristic and palmitic acid were reduced. However, the proportion of conjugated linoleic acid, an important human health promoter, was reduced. Therefore, further research is needed before concluding that quebracho tannin extract may improve the nutritional quality of cow milk in human diets.

<https://doi.org/10.3168/jds.2016-12149>.

Production and nitrogen utilization in lactating dairy cows fed ground field peas with or without ruminally protected lysine and methionine. *By Pereira et al., page 6239.* We compared the effects of the following diets on milk yield and nitrogen utilization in dairy cows: (1) urea versus peas, (2) ground corn plus soybean meal versus peas with both diets supplemented with the essential amino acids lysine and methionine, and (3) peas versus peas supplemented with lysine and methionine. Milk yield did not differ across diets. Feed intake and concentrations of milk protein and plasma lysine were less in cows fed urea versus those fed peas. Cows fed peas had lower concentrations of milk protein and plasma methionine than those fed peas supplemented with amino acids.

<https://doi.org/10.3168/jds.2016-12140>.

Fatty acid profile of goat milk in diets supplemented with chia seed (*Salvia hispanica* L.). *By Schettino et al., page 6256.* Chia seed (*Salvia hispanica* L.) contains the greatest known plant source of n-3 α -linolenic acid. Three inclusion levels of chia seed—zero, low (2.7%), and high (5.5%)—were supplemented in 9 dairy goats distributed in a Latin square design repeated 3×3 . The total conjugated linoleic acid content increased from 0.33% to 0.73% with the supplementation of chia in the diet, as well as the isomers *cis*-9,*trans*-11, *trans*-7,*cis*-9, *trans*-11,*cis*-13, and *trans*-12,*trans*-14.

<https://doi.org/10.3168/jds.2017-12785>.

Short communication: Use of fecal starch concentration as an indicator of dry feed digestion in preweaned dairy calves. *By Dennis et al., page 6266.* Fecal starch concentration (% of fecal dry matter) in the preweaned calf measured at 3 and 6 wk of age was not a good indicator of starch or organic matter digestibility of the starter. Preweaning starch digestibility was influenced by starter intake, calf age, and milk replacer feeding rate. Postweaning starch digestibility measured at 8 wk of age was influenced by starter intake and previous milk replacer feeding rate and was negatively correlated to fecal starch concentration. Postweaning organic matter digestibility was influenced by starter intake and previous milk replacer feeding rate but was not correlated to fecal starch concentration.

<https://doi.org/10.3168/jds.2016-12434>.

Cow and environmental factors associated with protein fractions and free amino acids predicted using mid-infrared spectroscopy in bovine milk. *By McDermott et al., page 6272.* Factors associated with both the protein composition and free amino acid composition of bovine milk, predicted using mid-infrared spectroscopy, were identified. These factors included stage of lactation, parity, milking time of day, calendar month of the test, breed of the cow, and the heterosis and recombination coefficients of the cow. Results from the study indicate that relative to older animals, younger animals produced milk with a greater concentration of total casein, α_{S1} -casein, and β -casein across all stages of lactation, which is desirable for cheese yield. Jersey cows produced a greater concentration of all casein fractions but less total free amino acids in the milk than Holsteins.

<https://doi.org/10.3168/jds.2016-12410>.

Variants in the 3' untranslated region of the ovine acetyl-coenzyme A acyltransferase 2 gene are associated with dairy traits and exhibit differential allelic expression. *By Miltiadou et al., page 6285.* The present study shows that the ovine acetyl-CoA acyltransferase 2 (*ACAA2*) gene is associated with milk production, milk protein percentage, and milk fat yield. Additionally, we demonstrated that the mRNA expression in homozygous animals for each allele of the *ACAA2* gene differs by several orders of magnitude in hepatic and mammary gland tissues and that the *ACAA2* variants are expressed at different levels in the udder of heterozygous animals, suggesting the existence of regulatory variation within the ovine *ACAA2* gene. These findings support the hypothesis that the *ACAA2* gene is a functional candidate affecting dairy traits in sheep.

<https://doi.org/10.3168/jds.2016-12326>.

Genetic parameters of blood β -hydroxybutyrate predicted from milk infrared spectra and clinical ketosis, and their associations with milk production traits in Norwegian Red cows. *By Belay et al., page 6298.* Blood β -hydroxybutyrate has been used as a gold standard indicator of ketosis. However, the gold standard method has practical limitations such as difficulty in blood sampling and capacity for analyzing many blood samples at a time. Blood β -hydroxybutyrate can be predicted from milk infrared spectra measured from analysis of milk samples at test days. Milk predicted blood β -hydroxybutyrate is heritable, with heritability estimates ranging from 0.25 to 0.36. It also has moderate positive genetic correlations with ketosis. Therefore, predicted blood β -hydroxybutyrate can be an alternative for breeding cows to have lower susceptibility to ketosis.

<https://doi.org/10.3168/jds.2016-12458>.

An attempt at predicting blood β -hydroxybutyrate from Fourier-transform mid-infrared spectra of milk using multivariate mixed models in Polish dairy cattle. *By Belay et al., page 6312.* In this study, two prediction approaches were compared for their ability to predict blood β -hydroxybutyrate from milk spectra. One approach (indirect prediction) transforms spectra to a single trait before analysis with a mixed model, whereas the other (direct prediction) uses a multitrait mixed model on (dimension-reduced) spectral variables to obtain multitrait predictions of random effects. Both approaches involve genetic analyses for ultimate phenotypic prediction. The performance of the two approaches was similar (with slightly better prediction by the indirect prediction) for phenotypic prediction. Prediction models for blood β -hydroxybutyrate from milk spectra and blood β -hydroxybutyrate measured by reference method were also developed.
<https://doi.org/10.3168/jds.2016-12252>.

Estimation of genetic parameters and heterosis for longevity in crossbred Danish dairy cattle. *By Clasen et al., page 6337.* Longevity is an important and profitable trait for dairy cattle farmers. A key factor for improving longevity is herd management, but longevity is also affected by genetics. In this study, we estimated heterosis effects within the three main Danish dairy cattle breeds. We conclude that crossbreeding is a beneficial tool for improving longevity.
<https://doi.org/10.3168/jds.2017-12627>.

Processing characteristics of dairy cow milk are moderately heritable. *By Visentin et al., page 6343.* Milk characterized by superior technological attributes is critical to meet the dairy industry targets of increasing production efficiency and output yield. The present study aimed to quantify the extent of genetic variability of predicted milk processing attributes across lactation and to quantify the genetic associations between such traits and milk yield and composition. All milk processing characteristics exhibited considerable heritable genetic variation, and the genetic correlations between these traits and both milk production and composition were generally weak to moderate. Animal genetic selection for improved milk processability is possible with only limited unfavorable effect on genetic gain in milk production.
<https://doi.org/10.3168/jds.2017-12642>.

Association analysis for young stock survival index with imputed whole-genome sequence variants in Nordic Holstein cattle. *By Wu et al., page 6356.* Genetic defects that cause cattle to die during the rearing period result in economic losses for dairy farmers. We report a genome-wide association study with imputed whole-genome sequence variants for young stock survival in Nordic Holstein cattle. We report a

putative causal mutation on *Bos taurus* autosome 5, along with some candidate genes affecting survival rate in young male and female stock. Several genes (*EPSS*, *LOC100138951*, and the *KLK* gene family) emerge as candidate genes affecting survival of young stock in Nordic Holsteins.
<https://doi.org/10.3168/jds.2017-12688>.

Short communication: Genetic parameters for milk protein composition predicted using mid-infrared spectroscopy in the French Montbéliarde, Normande, and Holstein dairy cattle breeds. *By Sanchez et al., page 6371.* More than 130,000 test-day records from 20,434 French Montbéliarde, Normande, and Holstein primiparous cows were used to estimate genetic parameters of milk protein composition predicted from mid-infrared spectrometry. In the three breeds, heritability estimates were moderate to high for all proteins, with β -lactoglobulin content being the most heritable trait. Total protein content was positively correlated with individual protein contents (as % milk) but almost genetically independent from individual protein fractions (as % protein). Protein fractions were generally in opposition (e.g., β -lactoglobulin was negatively correlated with caseins), whereas protein contents, especially caseins, were positively correlated. Milk protein composition, estimated by mid-infrared spectra, can be modified by selection.
<https://doi.org/10.3168/jds.2017-12663>.

Trained-user opinion about Welfare Quality measures and integrated scoring of dairy cattle welfare. *By de Graaf et al., page 6376.* Overall welfare assessments can be used for communicating with consumers (e.g., labeling), as an incentive for welfare improvements, and as a regulative target. Such assessments should be valid and reliable and should balance the relative importance of various welfare measures. The Welfare Quality approach is one of the most well-known methods for overall welfare assessment. However, the present study shows that the Welfare Quality integration method should be revised if it is to correspond with the opinions of trained users of the Welfare Quality protocol for dairy cattle.
<https://doi.org/10.3168/jds.2016-12255>.

Regulatory effect of dietary intake of chromium propionate on the response of monocyte-derived macrophages from Holstein cows in mid lactation. *By Garcia et al., page 6389.* Chromium supplementation has been reported to improve insulin sensitivity and cattle performance. However, its effect on the bovine macrophage inflammatory and metabolic response is still unknown. Our results suggest that dietary chromium alters the inflammatory and metabolic responses of monocyte-derived macrophages for lactating cows in mid lactation. Future experiments

that examine the effect of chromium supplementation using immune cells from cows in early lactation are warranted.

<https://doi.org/10.3168/jds.2016-12079>.

The use of national-level data to describe trends in intramammary antimicrobial usage on Irish dairy farms from 2003 to 2015. *By More et al., page 6400.* Intramammary antimicrobials are used to treat and prevent mastitis in dairy cows as part of a broader control strategy. These products are used both during lactation and immediately prior to the dry period. In this study, we used national-level data to describe changes in on-farm intramammary antimicrobial usage in Ireland from 2003 to 2015. Lactation usage has decreased in recent years, whereas almost all cows now receive antimicrobials at drying off. There is a small but increasing use of highest priority antimicrobials that are considered critically important for human health. Farm-level data are required to enable benchmarking of farm usage.

<https://doi.org/10.3168/jds.2016-12068>.

Host-pathogen interactions in bovine mammary epithelial cells and HeLa cells by *Staphylococcus aureus* isolated from subclinical bovine mastitis. *By Castilho et al., page 6414.* *Staphylococcus aureus* is one of the microorganisms most commonly isolated from the milk of cows with subclinical mastitis, an inflammation of the mammary glands that causes significant economic losses in dairy cattle. This microorganism presents several virulence factors, including biofilm production, and has microbial surface components that recognize adhesive matrix molecules proteins, which allow the bacterium to adhere to and invade cells from the mammary epithelium. We noticed that the isolates invaded bovine mammary epithelial cells more efficiently than HeLa cells (of human origin). We could not use bovine mammary epithelial cells in biofilm production assays because there was not enough time to produce biofilm due to fast invasion.

<https://doi.org/10.3168/jds.2017-12700>.

A commercial immune modulating feed additive restores L-selectin and *CCL5* expression following dexamethasone treatment of murine immune cells in a *MyD88*-dependent manner. *By Ortiz-Martí et al., page 6422.* Dairy cows are at a higher risk of developing mastitis during the periparturient period due to stress-induced immunosuppression. Feed additives can support immune function during the periparturient period. Our research investigated the mechanism by which this occurs. The results of these experiments provide information that could further the use of dietary supplements in immunosuppressive conditions.

<https://doi.org/10.3168/jds.2016-11783>.

Clinical trial of local anesthetic protocols for acute pain associated with caustic paste disbudding in dairy calves. *By Winder et al., page 6429.* Few peer-reviewed trials have examined best practices for the control of acute pain associated with caustic paste disbudding. Several of these studies conflict regarding the potential benefit of local anesthesia. We found that a lidocaine cornual nerve block and injectable meloxicam effectively controlled the acute pain associated with caustic paste disbudding, whereas a novel caustic paste incorporating topical anesthetic did not. Without local anesthetic, caustic paste is acutely painful for at least 3 h after application.

<https://doi.org/10.3168/jds.2017-12724>.

Phenotypic and genotypic antimicrobial susceptibility pattern of *Streptococcus* spp. isolated from cases of clinical mastitis in dairy cattle in Poland. *By Kaczorek et al., page 6442.* Mastitis of dairy cattle is one of the most frequently diagnosed diseases worldwide. The main aetiological agents of mastitis are bacteria of the genus *Streptococcus* spp., in which several antibiotic resistance mechanisms have been identified. This study examined the antibiotic resistance pattern of *Streptococcus* spp. isolated from clinical cases of mastitis in dairy cattle in the northeast region of Poland. The obtained results raise concerns regarding the growing presence of antibiotic resistance in streptococci isolated from Poland (e.g., presence of the *blaZ* gene).

<https://doi.org/10.3168/jds.2017-12660>.

Coagulase-negative staphylococci species affect biofilm formation of other coagulase-negative and coagulase-positive staphylococci. *By Goetz et al., page 6454.* Coagulase-negative staphylococci are increasingly recognized as emerging mastitis pathogens. Biofilm formation appears to be an important factor in coagulase-negative staphylococci pathogenicity. Coagulase-negative staphylococci colonization of the intramammary environment has been proposed by some researchers to have a protective effect against other prevalent pathogens. The mechanisms have yet to be characterized. The aim of this study was to evaluate the effect of coagulase-negative staphylococci isolates with a weak biofilm phenotype on the biofilm formation of other staphylococci associated with bovine mastitis.

<https://doi.org/10.3168/jds.2017-12629>.

Evaluation of the capillary electrophoresis method for measurement of immunoglobulin concentration in ewe colostrum. *By Lopreiato et al., page 6465.* This study represents, to our knowledge, the first work to evaluate capillary electrophoresis as a rapid tool for quantifying immunoglobulin content with a specific focus on ewe colostrum. The results indicated

that capillary electrophoresis had high agreement with the reference method for the measurement of immunoglobulin concentration in colostrum represented by the radial immunodiffusion method.
<https://doi.org/10.3168/jds.2016-12284>.

The effect of different treatments for early-lactation hyperketonemia on blood β -hydroxybutyrate, plasma nonesterified fatty acids, glucose, insulin, and glucagon in dairy cattle. *By Mann et al., page 6470.* The incidence of metabolic disorders is greatest in the immediate peripartum period in dairy cows. Hyperketonemia affects approximately 40% of cows in early lactation, and this disorder has a significant effect on health and productivity. There is currently a lack of evidence from controlled studies comparing different treatments side by side targeted at reducing the concentrations of β -hydroxybutyrate. We tested 3 treatment strategies commonly used in the dairy industry (propylene glycol orally, glucose intravenously, and the combination of both) compared with an untreated control. The combination treatment was most effective in decreasing β -hydroxybutyrate concentrations.
<https://doi.org/10.3168/jds.2016-12532>.

A cohort study of the effect of winter dysentery on herd-level milk production. *By Toftaker et al., page 6483.* Winter dysentery is characterized by herd outbreaks of acute contagious diarrhea in adult cattle. This study estimated the effect on milk production and milk composition based on reports of winter dysentery in 224 dairy herds. The estimated maximum decrease in milk production was 15% for the average herd. The effect on milk composition was modest; however, the contents of free fatty acids increased by 11% in the first measurement after the outbreak. The consequences found in this study should motivate farmers, veterinarians, and other stakeholders to implement preventive measures to limit the spread of winter dysentery between herds.
<https://doi.org/10.3168/jds.2017-12605>.

Gait of dairy cows on floors with different slipperiness. *By Telezhenko et al., page 6494.* This study examined the effect of walkway floor type and slip resistance on the gait of dairy cows. The floors tested represent different solutions for safe locomotion in freestall systems and consisted of smooth concrete flooring with tamped or grooved patterns, mastic asphalt, or rubber mats as a surface contact area. Floor surface was characterized by coefficient of friction, skid resistance, abrasiveness, and gait analysis. The results are useful for formulating recommendations to improve the floor design of new and existing walking areas in cattle hous-

ing. Safe walking areas will promote cow traffic, health and fertility, and dairy cow performance.
<https://doi.org/10.3168/jds.2016-12208>.

Efficacy and clinical safety of pegbovigrastim for preventing naturally occurring clinical mastitis in periparturient primiparous and multiparous cows on US commercial dairies. *By Canning et al., page 6504.* Cows experience depressed neutrophil function around calving, leading to increased susceptibility to clinical mastitis. Cows and heifers treated with bovine granulocyte colony-stimulating factor bound to polyethylene glycol (pegbovigrastim) developed significantly fewer clinical mastitis events than saline-treated control animals. Pegbovigrastim was well tolerated and had no negative effect on the dams or their progeny. These results indicate that pegbovigrastim is a useful tool for preventing clinical mastitis around the time of calving.
<https://doi.org/10.3168/jds.2017-12583>.

Effects of changing freestall area on lameness, lying time, and leg injuries on dairy farms in Alberta, Canada. *By Morabito et al., page 6516.* Improving dairy cow comfort has become a major priority of the dairy industry. Previous studies evaluated risk factors affecting cow comfort; however, there is a lack of information on how changing cows' freestall environment affects cow comfort. The results of this study reveal that farms that made changes to the freestall environment had better cow comfort, including higher lying time, and lower lameness prevalence. These results demonstrate the importance of improving dairy cow environments and provide evidence to pursue this research as a longitudinal study to better elucidate the effects of facility changes.
<https://doi.org/10.3168/jds.2016-12467>.

Evaluation of an automated milk leukocyte differential test and the California Mastitis Test for detecting intramammary infection in early- and late-lactation quarters and cows. *By Godden et al., page 6527.* The objectives of this study were (1) to describe the diagnostic test characteristics of an automated milk leukocyte differential test and the California Mastitis Test to identify intramammary infection in early-lactation and late-lactation quarters and cows and (2) to describe the repeatability of milk leukocyte differential test results at the quarter and cow levels. When interpreted at the quarter level, the milk leukocyte differential and California Mastitis Tests demonstrated low sensitivity and fair to very good specificity in early-lactation quarters and fair to good sensitivity and specificity in late-lactation quarters depending on the cutpoint selected. Sensitivity improved slightly, but

specificity declined when test results were interpreted at the cow level.
<https://doi.org/10.3168/jds.2017-12548>.

Estimation of prevalence and incidence of subclinical mastitis in a large population of Brazilian dairy herds. *By Busanello et al., page 6545.* Subclinical mastitis is the most common disease of dairy cattle. This study was conducted to estimate the occurrence of subclinical mastitis in a large population of Brazilian dairy herds and to describe longitudinal changes between 2011 and 2015. Results of this study highlight the gravity of the occurrence of mastitis in Brazil and can be used by government agencies, dairy industries, and milk producers to develop large-scale milk quality programs.
<https://doi.org/10.3168/jds.2016-12042>.

Within-herd prevalence of intramammary infection caused by *Mycoplasma bovis* and associations between cow udder health, milk yield, and composition. *By Timonen et al., page 6554.* The objective of the study was to identify the within-herd prevalence of subclinical intramammary infection caused by *Mycoplasma bovis* and to find associations between subclinical *M. bovis* intramammary infection, cow daily milk yield, somatic cell count, and milk composition. The within-herd prevalence of subclinical *M. bovis* intramammary infection was 17.2% based on 522 cows from 1 herd. The presence of *M. bovis* in the milk sample was associated with lower cow daily milk yield, milk fat, and urea content and higher somatic cell count. Therefore, subclinical *M. bovis* mastitis should be actively controlled in dairy herds.
<https://doi.org/10.3168/jds.2016-12267>.

Short communication: Behavioral evaluation of the analgesic effect of flunixin meglumine in lame dairy cows. *By Wagner et al., page 6562.* The well-being of dairy cows may be improved by relieving the pain associated with lameness. Cows with lameness pain shift their weight between their rear limbs more than nonlame cows. We tested a single treatment with the drug flunixin meglumine and found that weight shifting was significantly lower in drug-treated cows compared with placebo-treated controls at 6, 12, and 24 h after treatment. This study provides evidence that lame cows treated with flunixin meglumine have less pain than lame cows treated with a saline placebo.
<https://doi.org/10.3168/jds.2016-12331>.

Short communication: Weak associations between mastitis control measures and bulk milk somatic cell counts in Swedish dairy herds. *By Emanuelson et al., page 6572.* Mastitis remains a major issue in dairy production despite the fact that control programs have been available for many years. Mastitis

control measures might fail to have their full effect due to poor implementation, poor or variable compliance, or variable effects of such measures. Our study aimed to assess the associations between 21 well-established mastitis control measures and udder health measured as bulk milk somatic cell count in Swedish dairy herds. The only 2 measures that were associated with the probability of a herd having a low bulk milk somatic cell count were providing dry cows with a specialized mineral feed and using postmilking teat disinfectant for all milking cows.
<https://doi.org/10.3168/jds.2016-12384>.

Technical note: Assessing lameness in tie-stalls using live stall lameness scoring. *By Palacio et al., page 6577.* Stall lameness scoring may be an effective method of scoring lameness for cows housed in tiestalls. We assessed whether stall lameness scoring is an effective and valid method of assessing lameness by comparing live stall lameness scoring with stall lameness scoring from video recordings and live locomotion scoring. Our results show that although live stall lameness scoring seems to underestimate lameness prevalence compared with live locomotion scoring, it can be used as a reliable alternative method of assessing lameness in tiestalls when locomotion scoring is not feasible and can save the need for extra equipment and time to evaluate recorded videos.
<https://doi.org/10.3168/jds.2016-12171>.

Survey of work processes on German dairy farms. *By Hesse et al., page 6583.* The objective of this study was to gain insight into the organization of work processes and to analyze the current management practices on German dairy farms considering the development and use of standard operating procedures and related challenges.
<https://doi.org/10.3168/jds.2016-12029>.

Nitrogen efficiency of eastern Canadian dairy herds: Effect on production performance and farm profitability. *By Fadul-Pacheco et al., page 6592.* After gathering data from 100 dairy farms, characteristics of herds with varying nitrogen efficiency (milk nitrogen/dietary nitrogen) were identified. The main dietary factors determined as different between the groups with the greatest and the least nitrogen efficiency were the concentrations of crude protein, nonfiber carbohydrates, and net energy for lactation and the amount of corn silage fed. In addition, greater milk yield and lower dry matter intake were characteristic of the groups with greater nitrogen efficiency. Consequently, a strong correlation was found between nitrogen efficiency and energy efficiency. Besides reducing the risk of nitrogen pollution, increasing nitrogen efficiency was shown to be economically profitable.
<https://doi.org/10.3168/jds.2016-11788>.

Production and economic responses to intensification of pasture-based dairy production systems. *By Macdonald et al., page 6602.* An efficiency argument often is made for increasing the output per hectare of land. However, this is prudent only if the cost of the additional production is less than the milk price received. Grazing systems were intensified and supported through use of nitrogen fertilizer or the importation of purchased feeds. All methods increased milk production per cow and per hectare. The marginal milk production response to the additional feed was the same irrespective of how the feed was derived, provided that the same amount of metabolizable energy was offered. However, the marginal cost of milk production from purchased feeds was considerably higher than the feed price. The results must be considered in partial budgeting exercises used to evaluate changes in system intensification.
<https://doi.org/10.3168/jds.2016-12497>.

Comparison of 2 recommendations for adjusting the working height in milking parlors. *By Jakob et al., page 6620.* Dairy parlor workers experience a high prevalence of musculoskeletal symptoms predominantly in the shoulders, lower back, and knees, and females suffer more often than men do. Measurements in modern milking parlors show that bending, stretching, or twisting is necessary to be able to reach the udder. A good parlor design with an appropriate platform height can help reduce the number of unfavorable working postures. The paper discusses 2 suggestions published for calculating the appropriate working height for adjustable floors or newly installed parlor constructions.
<https://doi.org/10.3168/jds.2016-12034>.

Season of conception is associated with future survival, fertility, and milk yield of Holstein cows. *By Pinedo et al., page 6631.* The objective was to quantify the association between heat stress at conception (when animals are conceived) and the animals' subsequent survival and performance as producing cows on dairy farms. Lactation records from cows calving between 2000 and 2012 in 152 herds were analyzed. Cows that were conceived during the summer had worse subsequent survival and performance than cows that were conceived in the winter. Heat stress at time of conception may have lifelong negative consequences.
<https://doi.org/10.3168/jds.2017-12662>.

Milking time and risk of over-milking can be decreased with early teat cup removal based on udder quarter milk flow without loss in milk yield. *By Krawczel et al., page 6640.* Decreased milking time is beneficial both for the cows, who are able to spend time on other activities, and for the farm, due to increased efficiency of the milking system as a whole. In this study, we found that milking time and

the risk of over-milking can be reduced by early teat cup removal, due to higher take-off levels, without loss in milk yield based on milk flow from individual udder quarters. Increasing the take-off level from 0.06 kg/min to 0.3 or 0.48 kg/min on the quarter level decreased milking time by 30 s and 1 min, respectively. Take-off at 0.48 kg/min decreased free fatty acid content but did not affect udder emptying.
<https://doi.org/10.3168/jds.2016-12312>.

Ad libitum milk replacer feeding, but not butyrate supplementation, affects growth performance as well as metabolic and endocrine traits in Holstein calves. *By Frieten et al., page 6648.* The effects of ad libitum milk replacer feeding with or without butyrate on growth performance and metabolic changes were tested in dairy calves. Ad libitum feeding enhances body growth and stimulates glucose metabolism, but calves showed lower concentrate intake and lower gain:feed ratio. Butyrate supplementation did not further improve body growth or the anabolic status of the calves and therefore failed to support preweaning development beyond the intensive milk-feeding program.
<https://doi.org/10.3168/jds.2017-12722>.

Key role of short-chain fatty acids in epithelial barrier failure during ruminal acidosis. *By Meissner et al., page 6662.* Subacute ruminal acidosis is a persisting problem in the dairy industry. Low ruminal pH has been identified as a main factor triggering an acidotic insult to the ruminal epithelium with subsequent translocation of bacteria and toxins. However, the effect of low ruminal pH seems to be modified by dietary components and individual susceptibility of the animal. In the present study, we demonstrated that high concentrations of short-chain fatty acids in the rumen are important amplifiers of the effect of low pH, thereby explaining why acidosis susceptibility may vary between different animals and different diets.
<https://doi.org/10.3168/jds.2016-12262>.

Optimal ratios of essential amino acids stimulate β -casein synthesis via activation of the mammalian target of rapamycin signaling pathway in MAC-T cells and bovine mammary tissue explants. *By Li et al., page 6676.* Amino acids are the building blocks of proteins and serve as key molecular components upstream of the signaling pathways that regulate protein synthesis. In this study with MAC-T cells and bovine mammary tissue explants, an optimal essential amino acid ratio stimulated β -casein expression partly due to enhancing the transport of amino acids, cross-talk with insulin signaling and a subsequent enhancement of mammalian target of rapamycin signaling, or via translation elongation. Therefore, an optimal essential amino acid ratio reaching mammary

cells would be advantageous for enhancing bovine milk protein synthesis.
<https://doi.org/10.3168/jds.2017-12681>.

Effect of endoplasmic reticulum stress on metabolic and stress signaling and kidney-specific functions in Madin-Darby bovine kidney cells. *By Chiappisi et al., page 6689.* Endoplasmic reticulum stress, a condition characterized by impaired function of the endoplasmic reticulum, occurs in tissues of postpartum dairy cows. Due to the lack of knowledge about cellular effects of endoplasmic reticulum stress in cattle, the present study investigated the effect of endoplasmic reticulum stress on important cellular processes, such as critical signaling and metabolic pathways, in a bovine cell line.
<https://doi.org/10.3168/jds.2016-12406>.

Identification and functional analysis of bull (*Bos taurus*) cauda epididymal fluid proteome. *By Westfalewicz et al., page 6707.* In this study, we identified 189 bull cauda epididymal proteins, 100 of which were newly identified. We combined our identification with previously available data and acquired the most complete bull epididymal fluid proteome to date, containing 280 proteins. This allowed for its comprehensive functional analysis. Our results point out multiple novel pathways in bull epididymal fluid that might take part in various aspects of the maturation and protection processes of epididymal spermatozoa.
<https://doi.org/10.3168/jds.2016-12526>.

Effect of nutritional immunomodulation and heat stress during the dry period on subsequent performance of cows. *By Fabris et al., page 6733.* Environmental factors such as high relative humidity and temperature can cause heat stress. Cows under heat stress during the dry period have impaired milk yield in the next lactation, which negatively affects profitability. Previous studies indicate that feeding OmniGen-AF before and during heat stress periods increases dry matter intake, lowers respiration rate and rectal temperature, and improves the immune status of heat-stressed lactating cattle. Dry cows under heat stress had greater yield in the next lactation when fed OmniGen-AF during the last 60 d in milk, the dry period, and up to 60 d in milk.
<https://doi.org/10.3168/jds.2016-12313>.

Nuclear receptor subfamily 1 group H member 2 (*LXRB*) is the predominant liver X receptor subtype regulating transcription of 2 major lipogenic genes in goat primary mammary epithelial cells. *By Shi et al., page 6743.* Potential differences between liver X receptor (LXR) subtypes in the regulatory control of ruminant lipid metabolism are unknown. We demonstrated in goat primary

mammary epithelial cells incubated with LXR agonist T0901317 that knockdown of *LXRB* decreased the messenger RNA expression of fatty acid synthase (*FASN*) but not sterol regulatory element binding factor 1 (*SREBP1*), whereas overexpression of *LXRB* increased the messenger RNA expression of both genes. However, knockdown or overexpression of *LXRA* had a weak effect on the messenger RNA abundance of these genes. Promoter luciferase activation analysis revealed that the *LXRB* subtype exerts transcriptional regulation of *SREBP1c* and *FASN*. Furthermore, the fact that *LXRB* increased the activation of *SREBP1c* and *FASN* promoters containing LXR response element mutations suggested that it could regulate lipid metabolism in a *SREBP1c*-dependent manner. Overall, the results highlight an important role of *LXRB* in the regulation of *SREBP1c* and *FASN* in goat mammary epithelial cells.
<https://doi.org/10.3168/jds.2016-12510>.

Characterization of the variability and repeatability of gonadotropin-releasing hormone-induced luteinizing hormone responses in dairy cows within a synchronized ovulation protocol. *By Gobikrushanth et al., page 6753.* A trait with high variability, repeatability, and heritability would be an ideal candidate for genomic selection. Luteinizing hormone has an important role in reproductive function; therefore, selecting cows with greater capacity for luteinizing hormone secretion could be a strategy to improve fertility in dairy cows. This study examined the variability and repeatability of gonadotropin-releasing hormone-induced luteinizing hormone response in dairy cows as a potential fertility trait. Despite its high variability, the use of gonadotropin-releasing hormone-induced luteinizing hormone response as a fertility trait for genomic selection remains questionable due to its poor repeatability.
<https://doi.org/10.3168/jds.2016-12529>.

Temporal and spatial water use on irrigated and nonirrigated pasture-based dairy farms. *By Higham et al., page 6772.* Water use was measured in 2 regions on irrigated and nonirrigated pasture-based dairy farms. Existing water use prediction models developed on nonirrigated dairy farms were found to be inaccurate on irrigated dairy farms. Therefore, new models were produced for predicting water use on irrigated dairy farms.
<https://doi.org/10.3168/jds.2016-12200>.

Methane emissions from dairy lagoons in the western United States. *By Leytem et al., page 6785.* Methane emissions determined from dairy lagoons vary seasonably and are heavily dependent on the physicochemical characteristics of the lagoon. Characteristics such as volatile solids, pH, wind speed, and temperature had the greatest influence on methane emissions.

Annual methane emissions measured on farm were twice as much as those estimated using the current US Environmental Protection Agency methodologies. An alternative estimation methodology was utilized that included a volatile solids degradation factor determined from on-farm literature values and appeared to provide better estimates of on-farm emissions.
<https://doi.org/10.3168/jds.2017-12777>.

Grazing intensity affects the environmental impact of dairy systems. *By Aguirre-Villegas et al., page 6804.* This paper quantified and compared greenhouse gas emissions, energy intensity, and land use of confined dairy systems with increasing levels of grazing. A life cycle assessment was conducted to evaluate whether these impacts can be reduced by introducing increasing levels of pasture in the dairy diet and by producing renewable energy from manure using anaerobic digestion systems. Overall, results were comparable between scenarios, but trends suggested that environmental impacts may be minimized when the right balance between feed from pasture and crop supplementation was achieved. Confined systems benefited significantly from the incorporation of an anaerobic digester by reducing emissions and energy intensity.
<https://doi.org/10.3168/jds.2016-12325>.

Effect of uncertainty in composition and weight measures in control of cheese yield and fat loss in large cheese factories. *By Margolies et al., page 6822.* Large cheese factories can convert more than 1,000,000 kg of milk to cheese daily. Small errors in process control measurements can have a large effect on financial performance. This study focused on associating uncertainty of several parameters in cheese making with their economic consequences. It was found that accurate measurement of milk weight, milk protein, milk fat, cheese moisture, cheese fat, and cheese salt is a key parameter that requires highly accurate analysis in order to ensure optimal production efficiency and cheese quality. The need for analytical method accuracy becomes more important as cheese factory capacity increases.
<https://doi.org/10.3168/jds.2016-12295>.

Genomic evaluation of age at first calving. *By Hutchison et al., page 6853.* In order to minimize management costs and to produce animals that are profitable earlier in their life, selection for cows that have a younger age at first calving could improve dairy cattle efficiency. Because age at first calving is a phenotypic trait recorded on US dairy farms, we investigated the feasibility of using these data in genomic selection. Favorable correlations with fertility and lifetime production traits, in addition to high sire reliabilities, suggest that age at first calving could be implemented as a new trait in genomic selection indices.
<https://doi.org/10.3168/jds.2016-12060>.

Management practices for male calves on Canadian dairy farms. *By Renaud et al., page 6862.* Male calves produced by the dairy industry require more focus and attention. The first days on the dairy farm are critical for the survival and performance of male calves. In this study, there was significant variability in the management of male calves with respect to colostrum, vaccination, feeding, navel dipping, and euthanizing bull calves at birth. Most variability was explained by geographical region and farm size. Improving male calf management on dairy farms will aid in preventing disease, reducing antimicrobial use, and improving productivity and overall welfare.
<https://doi.org/10.3168/jds.2017-12750>.

A survey of dairy calf management practices among farms using manual and automated milk feeding systems in Canada. *By Medrano-Galarza et al., page 6872.* Milk feeding and housing practices play an important role in ensuring good calf health and welfare. This study presents a survey of management practices being used to raise calves on Canadian dairy farms using manual or automated milk feeding systems and provides insight into how the use of automated milk feeders is affecting calf feeding and management.
<https://doi.org/10.3168/jds.2016-12273>.