

## INTERPRETIVE SUMMARIES, MAY 2019

**Invited review: Plant polyphenols and rumen microbiota responsible for fatty acid biohydrogenation, fiber digestion, and methane emission: Experimental evidence and methodological approaches.** By Vasta et al., page 3781. The interest of the scientific community in the effects of plant polyphenols on animal nutrition is increasing. Polyphenols interact with rumen microbiota, resulting in different effects on carbohydrate fermentation, protein degradation, and lipid metabolism. A critical review of the recent literature about the effect of plant polyphenols on rumen microbiota responsible for fatty acid biohydrogenation, fiber digestion, and methane production is presented, taking into consideration the advances in microbiota analysis achieved in the last 10 years. <https://doi.org/10.3168/jds.2018-14985>.

**Invited review: Examining farmers' personalities and attitudes as possible risk factors for dairy cattle health, welfare, productivity, and farm management: A systematic scoping review.** By Adler et al., page 3805. Do farmers' personalities and attitudes influence dairy cattle performance and management? This review reports approaches and results. The question of whether farmers as people influence animal performance and farm management has received increasing attention. Attitude and personality are psychological concepts characterizing such intrapersonal factors. We report which approaches scientists have used to answer the question of whether these concepts are such influencing factors. We show that attitude and personality affect outcomes but also identify methodological aspects that hinder overall conclusions. This review may benefit scientists planning future research and professionals considering mindset aspects when working together with farmers. <https://doi.org/10.3168/jds.2018-15037>.

**Proteomics and microstructure profiling of goat milk protein after homogenization.** By Chen et al., page 3839. This work further investigated the unique features of goat milk proteins after homogenization. This paper inspected the aspects and applications of quantitative proteomics on goat milk proteins during homogenization, performed bioinformatics analysis, and studied changes in the microstructure of whey protein and casein micelles. Significant changes were found in the homogenization-treated goat milk proteome that were related to goat milk glycolysis/gluconeogenesis metabolism, which provides updated information of homogenized goat milk and useful information for the dairy industry. <https://doi.org/10.3168/jds.2018-15363>.

**Metabolomic analysis of significant changes in *Lactobacillus casei* Zhang during culturing to generation 4,000 under conditions of glucose restriction.** By Pan et al., page 3851. During the process of growth and reproduction, bacteria will encounter environmental stress that may include reduced carbon sources, low or high temperatures, acid, salt, or oxygen. At this time, the bacteria face survival pressure. A glucose-restricted environment, which is among the causes of nutritional stress, commonly occurs during industrial production. Information on the changes in metabolites during the growth and reproduction of probiotics such as *Lactobacillus casei* Zhang in a glucose-limited environment can be used to ensure metabolic stability and provide a theoretical basis for subsequent research and improved industrialization. In the present study, ultra-performance liquid chromatography/quadrupole time-of-flight mass spectrometry was used to perform a metabolomic analysis of *L. casei* Zhang in a glucose-restricted environment, and the results were compared with those from the original strain during culturing for up to 4,000 generations. <https://doi.org/10.3168/jds.2018-15702>.

**Characterization and adsorption of a *Lactobacillus plantarum* virulent phage.** By Chen et al., page 3879. Bacteriophage infections of lactic acid bacteria are considered one of the biggest worldwide problems in the food industry because of their negative effects on the fermentation of various dairy-based products. A virulent bacteriophage (P2) was isolated from an abnormal fermentation liquid of *Lactobacillus plantarum* IMAU10120 belonging to the *Siphoviridae* family. This study evaluated the influence of temperature, pH value, divalent cations, and chloramphenicol on its adsorption ability. The information obtained in this study will enrich the database of *lactobacilli* virulent phages and provide a basis of information for the control of phages in the food fermentation industry. <https://doi.org/10.3168/jds.2018-16019>.

**Characterization of cottage cheese using *Weissella cibaria* D30: Physicochemical, antioxidant, and antilisterial properties.** By Kariyawasam et al., page 3887. There is increasing interest in adding probiotic strains to enhance microbial safety and quality of cheese. The *Weissella cibaria* D30 strain was isolated from Korean kimchi and used as an adjunct culture in cottage cheese. The probiotic cottage cheese demonstrated probiotic characteristics, including viability of lactic acid bacteria, compositional parameters, and antioxidant and antilisterial activities. *Weissella cibaria*

D30 may have potential as an adjunct culture in the dairy industry.

<https://doi.org/10.3168/jds.2018-15360>.

**Olive oil polyphenol extract inhibits vegetative cells of *Bacillus cereus* isolated from raw milk.**

*By Fei et al., page 3894.* *Bacillus cereus* can cause serious food-borne disease outbreaks and accelerate the spoilage of dairy products. Olive oil polyphenol extract as a natural product was shown to have satisfactory antimicrobial activity against *Bacillus cereus* vegetative cells in sterile normal saline and pasteurized milk, and its possible mechanism of action was clarified. Overall, this study offers a new method for preventing and inactivating *Bacillus cereus* cells in dairy products.

<https://doi.org/10.3168/jds.2018-15184>.

**Investigating the bacterial microbiota of traditional fermented dairy products using propidium monoazide with single-molecule real-time sequencing.**

*By Mo et al., page 3912.* Culture-independent profiling methods based on total DNA lead to an overestimation of the bacterial community in dairy samples. Propidium monoazide (PMA) is a DNA-binding fluorescent dye that is increasingly being applied for selective detection of viable microbes. We combined PMA with PacBio single-molecule real-time (SMRT) sequencing (Pacific Biosciences Inc., Menlo Park, CA) to investigate bacterial communities of traditional dairy foods from Mongolia and Inner Mongolia. The PMA-treated and untreated samples differed significantly in their bacterial community composition. This work provides an accurate measurement of bacterial population structure associated with traditional fermented dairy foods.

<https://doi.org/10.3168/jds.2018-15756>.

**Effect of heat treatment on activity of staphylococcal enterotoxins of type A, B, and C in milk.**

*By Necidová et al., page 3924.* Milk and selected dairy products are at risk of contamination by coagulase-positive staphylococci and staphylococcal enterotoxins. Staphylococcal food poisoning is one of the most prevalent causes of foodborne intoxication worldwide. Milk pasteurization or sterilization is a crucial step toward ensuring milk safety. The aim of this study was to analyze the thermal stability of staphylococcal enterotoxins types A, B, and C produced by *Staphylococcus aureus* strains in milk and their inactivation at temperatures of 100°C, 110°C, and 121°C. Of the 3 enterotoxin types tested, staphylococcal enterotoxin A showed the highest level of heat resistance.

<https://doi.org/10.3168/jds.2018-15255>.

**Effect of pH adjustment on the composition and rennet-gelation properties of milk concentrates made from ultrafiltration and reverse osmosis.**

*By Lauzin et al., page 3939.* The use of milk concentrated by reverse osmosis for cheesemaking is promising, as it may lead to higher cheese yields and reduced environmental impacts, which could increase the eco-efficiency of milk processing. However, these concentrates are not well characterized, and a better understanding of their properties is necessary to optimize their use for cheesemaking.

<https://doi.org/10.3168/jds.2018-15902>.

**Effect of goat milk composition on cheesemaking traits and daily cheese production.**

*By Pazzola et al., page 3947.* The composition of milk strongly influences cheesemaking ability. This study showed that, in goat milk, high levels of fat and protein improved percentages of both cheese yield and daily production because the recovery of milk nutrients in the curd was linked to the composition of milk. In addition, casein number, calculated as casein-to-protein ratio, affected the recovery of fat in the curd. This new knowledge could be useful to improve caprine dairy industry.

<https://doi.org/10.3168/jds.2018-15397>.

**Neither thermosonication nor cold sonication is better than pasteurization for milk shelf life.**

*By Lim et al., page 3965.* The objective of this research was to evaluate the potential for short-duration ( $\leq 60$  s) sonication treatment, in conjunction with pasteurization, to increase milk shelf life while producing no adverse aroma effect. Whether sonicated at  $12.5 \pm 5^\circ\text{C}$  (cold sonication) before pasteurization, or immediately after pasteurization at  $72.5 \pm 0.3^\circ\text{C}$  (thermosonication), total aerobic counts were not improved by the technology. Counts of spore-forming thermotolerant psychrophilic bacteria were higher than those enumerated after standard pasteurization.

<https://doi.org/10.3168/jds.2018-15347>.

**Short communication: Composition of coproduct streams from dairy processing: Acid whey and milk permeate.**

*By Menchik et al., page 3978.* This paper provides composition data for some dairy coproducts of high economic and environmental relevance, including acid whey from Greek yogurt, acid whey from cottage cheese, and milk permeate. This information will assist processors and researchers in developing value-added uses of these dairy coproducts.

<https://doi.org/10.3168/jds.2018-15951>.

**Effect of energy source in calf milk replacer on performance, digestibility, and gut permeability in rearing calves.**

*By Amado et al., page 3994.* In the current trend to increase nutrient supply to dairy calves, feeding levels of calf milk replacer are increased without changing the formulation. Effects of exchanging lactose for fat in calf milk replacer on performance and gastrointestinal health in male dairy calves on a

high feeding level were investigated. Energy source did not affect gain, total energy or protein intakes, or apparent digestibility. Gut permeability was low in both treatments, although higher in the high-fat treatment, which presented fewer abnormal fecal scores in the first weeks and during weaning.  
<https://doi.org/10.3168/jds.2018-15847>.

**Comparative analyses of estimated and calorimetrically determined energy balance in high-yielding dairy cows.** *By Erdmann et al., page 4002.* A negative energy balance develops when the energy requirements for maintenance and performance are not covered by feed consumption. In dairy cows, excessive negative energy balance is linked to reduced metabolic health, reproductive fitness, and milk yield. We conducted this study to compare the energy balance estimated using common equations or the calorimetrically measured heat production of pregnant and early-lactating German Holstein cows. Our results elucidate main factors responsible for the observed deviation between estimated and heat production-based energy balance and will help to improve our ability to predict the true energy status with higher accuracy.  
<https://doi.org/10.3168/jds.2018-15017>.

**Assessing bioavailability of ruminally protected methionine and lysine prototypes.** *By Fleming et al., page 4014.* Three rumen-protected methionine prototypes and one rumen-protected lysine prototype were assessed for amino acid (AA) bioavailability and their effect on lactation performance. An infusion trial and a feeding trial were conducted to estimate ruminal protection, plasma AA appearance, and prototype effects on lactational performance. All prototypes elicited plasma AA responses, and some prototypes improved milk protein concentrations, indicating that they were at least partially absorbed. Having accurate knowledge of AA bioavailability and knowing the effect on lactational performance will help improve dietary formulations, enhance overall milk production, reduce nitrogen excretion, and minimize feed costs.  
<https://doi.org/10.3168/jds.2018-14667>.

**Distinct blood and milk 18-carbon fatty acid proportions and buccal bacterial populations in dairy cows differing in reticulorumen pH response to dietary supplementation of rapidly fermentable carbohydrates.** *By Dewanckele et al., page 4025.* Diet-induced milk fat depression in dairy cows is characterized by a reduction in milk fat content and yield. It causes economic loss and reduction in feed conversion efficiency and affects the quality and taste of milk. It is associated with a shift in the ruminal microbial process responsible for the saturation of polyunsaturated fatty acids. However, the microbial etiology of this shift is not well understood. This study

contributes to a more comprehensive understanding of bacterial community shifts, which occur during milk fat depression, that will eventually help to develop dietary or management practices to avoid diet-induced milk fat depression.  
<https://doi.org/10.3168/jds.2018-15823>.

**Effect of diet energy density and genomic residual feed intake on prebred dairy heifer feed efficiency, growth, and manure excretion.** *By Williams et al., page 4041.* Heifer rearing is a large expenditure for dairy producers. For this reason, selecting for more efficient heifers and potentially decreasing feed costs can improve profit. Residual feed intake is the difference between an animal's actual and expected energy intake and is a tool for selecting animals with greater feed efficiency. This study investigated the interaction between genomic residual feed intake and diet energy density for prebred Holstein dairy heifers. Prebred heifers with different genomic residual feed intake had similar feed efficiencies whether fed a high- or a low-energy diet. Feeding a higher-energy diet improved efficiency, but heifers had weight gains above the optimal range of 0.8 to 1.0 kg/d.  
<https://doi.org/10.3168/jds.2018-15504>.

**Reconstituted versus dry alfalfa hay in starter feed diets of Holstein dairy calves: Effects on growth performance, nutrient digestibility, and metabolic indications of rumen development.** *By Kargar and Kanani, page 4051.* Little is known regarding the effects of reconstitution of alfalfa hay on starter feed intake, nutrient digestibility, growth performance, and metabolic indications of rumen development of dairy calves. Twenty newborn male Holstein calves were used to determine the effects of reconstitution of alfalfa hay on nutrient intake and digestibility, growth performance, rumen fermentation characteristics, and blood biochemical metabolites during pre- and post-weaning periods. Treatments included either dry alfalfa hay or reconstituted alfalfa hay at 10% of dietary dry matter. Reconstitution of alfalfa hay did not influence feed intake and growth performance in dairy calves but improved health-related variables (fecal score and general appearance score).  
<https://doi.org/10.3168/jds.2018-15153>.

**Reconstituted versus dry alfalfa hay in starter feed diets of Holstein dairy calves: Effects on feed intake, feeding and chewing behavior, feed preference, and health criteria.** *By Kargar and Kanani, page 4061.* Little is known regarding the effects of feeding reconstituted versus dry alfalfa hay to dairy calves on meal pattern, diet selection, and health criteria. Twenty neonatal male Holstein calves were used to investigate the effects of feeding reconstituted versus dry alfalfa hay on feeding and chewing behavior,

sorting activity, and health status. Treatments included either dry or reconstituted alfalfa hay at 10% of dietary dry matter. Reconstitution of alfalfa hay changed meal pattern and increased feeding time but did not affect feed intake. Calves in both treatment groups sorted for medium and short particles to meet their nutritional needs. Reconstitution of alfalfa hay improved health status, possibly through reducing diet dustiness and improving immune function.  
<https://doi.org/10.3168/jds.2018-15189>.

**Phosphorus content of muscle tissue and muscle function in dairy cows fed a phosphorus-deficient diet during the transition period.** *By Grünberg et al., page 4072.* Hypophosphatemia and phosphorus deprivation are widely believed to be associated with muscle weakness and recumbency in cows in early lactation. The objective of the present study was to investigate the effect of phosphorus deprivation on biochemical composition of muscle tissue and on muscle function at a clinical and subclinical level. In this study, clinical signs commonly associated with hypophosphatemia could not be reproduced, but subclinical effects of phosphorus deprivation on muscle function could be documented. These results provide an improved understanding of the role of phosphorus for muscle function in cattle.  
<https://doi.org/10.3168/jds.2018-15727>.

**Short-term lactation and mammary metabolism responses in lactating goats to graded removal of methionine from an intravenously infused complete amino acid mixture.** *By Liu et al., page 4094.* Graded removal of methionine from an intravenously infused amino acid mixture into lactating goats for 9 hours decreased milk protein yield linearly. The decrease was clearly not a mass action of methionine, because graded methionine removal did not decrease its mammary uptake because of the linearly increased mammary blood flow and methionine affinity. Results of the present study indicated that a change in the mechanistic target of rapamycin complex 1 signaling pathway in the mammary gland played a role in milk protein depression by graded methionine removal.  
<https://doi.org/10.3168/jds.2018-15643>.

**Factors associated with the content of mammary-synthesized fatty acids in milk fat: A meta-analysis.** *By Ungerfeld et al., page 4105.* Butyrate and other fatty acids synthesized in the mammary gland are of much interest to the nutrition community and informed consumers because of their potential implications for human health. This meta-analysis identified ether extract as the dietary fraction most associated with fatty acids synthesized in the mammary gland in goats and, to a somewhat lesser extent, in cows and sheep. The most important finding of this study was

that the research group conducting the experiments, and the laboratory methods of fatty acid analysis, accounted for most of the variation in mammary-synthesized fatty acids.  
<https://doi.org/10.3168/jds.2018-15157>.

**Productive performance and digestive response of dairy cows fed different diets combining a total mixed ration and fresh forage.** *By Pastorini et al., page 4118.* The purpose of this experiment was to quantify the effects of increasing the percentage of fresh forage on the productive performance and digestive response of dairy cows fed a total mixed ration. An inclusion of up to 29% fresh forage in the total dry matter intake did not affect the intake of nutrients nor the productive response in dairy cows fed a total mixed ration, but resulted in a milk fat profile with an enhanced content of desirable fatty acids for the consumer.  
<https://doi.org/10.3168/jds.2018-15389>.

**Effects of corn silage inclusion in preweaning calf diets.** *By Kehoe et al., page 4131.* Some farmers are interested in adding corn silage to preweaning calf diets. In our experiment, calves were provided either all calf starter, all corn silage, or a mixture of 25% calf starter and 75% corn silage on an as-fed basis. We report significantly longer and wider rumen papillae in calves fed only calf starter. Calves fed only corn silage had significantly decreased ruminal and intestinal surface area. Calves fed a mixture of calf starter and corn silage had similar intestinal morphology and growth performance to calves fed only calf starter, indicating that some addition of corn silage may not affect calves through weaning.  
<https://doi.org/10.3168/jds.2018-15799>.

**Incremental amounts of rumen-protected histidine increase plasma and muscle histidine concentrations and milk protein yield in dairy cows fed a metabolizable protein-deficient diet.** *By Zhang et al., page 4138.* Bovine diets low in crude protein are known to reduce nitrogen excretion to the environment but may also result in deficiencies of essential amino acids such as methionine, lysine, and histidine. Supplementation of rumen-protected (RP)-amino acids has been used to alleviate amino acid shortages, which in turn maintains or improves yields of milk and milk protein. Blood and muscle histidine concentrations and milk protein yield increased linearly in cows fed incremental amounts of RP-histidine. In contrast, feed intake and digestibility of nutrients were not affected by supplemental RP-histidine. Future research is needed to determine the bioavailability of RP-histidine supplements, to improve the accuracy of dietary amino acid formulation.  
<https://doi.org/10.3168/jds.2018-15780>.

**Milk production and nutrient digestibility responses to triglyceride or fatty acid supplements enriched in palmitic acid.** *By de Souza and Lock, page 4155.* The objective of our study was to evaluate the effects of feeding triglyceride or fatty acid supplements enriched in palmitic acid (C16:0) on production and nutrient digestibility responses of mid-lactation dairy cows. We observed that feeding palmitic acid supplements increased neutral detergent fiber digestibility, milk fat yield, 3.5% fat-corrected milk, and feed efficiency of mid-lactation dairy cows. Additionally, the production response of dairy cows tended to be greater for a fatty acid supplement than for a triglyceride supplement, due to higher intake and fatty acid digestibility associated with the fatty acid compared with the triglyceride supplement.  
<https://doi.org/10.3168/jds.2018-15690>.

**Effect of dietary crude protein degradability and corn processing on lactation performance and milk protein composition and stability.** *By Martins et al., page 4165.* It is well established that when rumen-degradable protein exceeds the rumen microbe requirements, there is an increase of ruminal ammonia concentration and urea excretion through urine. However, contradictory data exist regarding whether the rumen-degradable protein depends on dietary carbohydrate digestibility to optimize lactation performance and nitrogen utilization efficiency. Additionally, the effects of crude protein degradability and corn processing on milk protein composition and its properties in dairy processing are unknown. In the present study, we observed that crude protein degradability and corn processing can affect lactation performance, efficiency of nitrogen utilization, and milk protein composition and stability.  
<https://doi.org/10.3168/jds.2018-15553>.

**Effects of exogenous fibrolytic and amylolytic enzymes on ruminal fermentation and performance of mid-lactation dairy cows.** *By Zilio et al., page 4179.* The low nutrient digestibility of dairy cows usually means a poor exploitation of dietary energy and high fecal nutrient excretion. Dietary enzymes have been fed to increase feed degradation and enhance the efficiency of dairy cows. This study showed no evidence that feeding both fibrolytic and amylolytic enzymes increases digestibility of nutrients and improves performance of mid-lactation cows.  
<https://doi.org/10.3168/jds.2018-14949>.

**Effect of butyrate on passive transfer of immunity in dairy calves.** *By Hiltz and Laarman, page 4190.* This study investigated butyrate supplementation and its effect on transfer of passive immunity—the antibodies obtained from the mother that allow the young to fight disease in the first weeks of life—from cows to

calves. We supplemented both the feed of cows in late gestation and the colostrum fed to calves at birth with butyrate and measured antibody content of colostrum and calf blood to determine passive transfer of immunity. Butyrate did not affect antibody concentration in colostrum but decreased serum IgG absorption in calves, demonstrating reduced transfer of passive immunity. Despite reduced antibody concentration in calf blood, growth of calves was unaffected.  
<https://doi.org/10.3168/jds.2018-15555>.

**Exogenous  $\beta$ -mannanase supplementation improved immunological and metabolic responses in lactating dairy cows.** *By Roque et al., page 4198.* We conducted a trial to investigate the effect of a fibrolytic enzyme ( $\beta$ -mannanase) on immunological and metabolic responses in lactating dairy cows. Cows that received enzyme supplementation tended to have lower plasma concentrations of haptoglobin, a marker of immune system activation.  $\beta$ -Mannanase decreased haptoglobin concentrations to a greater degree in multiparous cows than in primiparous cows. Supplementation did not affect milk yield or composition in primiparous and multiparous cows. Supplementing diets with  $\beta$ -mannanase may help decrease activation of the immune system in high-producing cows without changing milk yield and composition.  
<https://doi.org/10.3168/jds.2018-15568>.

**Short communication: Gelatinization and enzymatic hydrolysis characteristics relevant to digestion and analysis of glycogen granules isolated from ruminal protozoa.** *By Hall, page 4205.* Rumen microbes digest much of the feed a cow consumes but also store some carbohydrates as glycogen, a compound similar to starch. Evaluation of protozoal glycogen showed that, like starch, it gelatinized with heating. Even ungelatinized, it was more extensively digested by enzymes than were corn or wheat starches. Based on its susceptibility to enzymatic hydrolysis, protozoal glycogen granules may be more digestible than plant starches and likely should be gelatinized for accurate analysis. Understanding digestion and analysis characteristics of microbial products helps to improve predictions of nutrient availability and accuracy of diets to meet cow needs.  
<https://doi.org/10.3168/jds.2018-15758>.

**Short communication: Survey of hepatic copper concentrations in Midwest dairy cows.** *By Strickland et al., page 4209.* Copper is stored in the liver of all mammals, and it can become toxic if liver accumulation becomes excessive. Copper toxicity has been a growing concern in dairy cows in recent years. We performed a review of dairy cow liver submissions to our laboratory for mineral analysis over a 9-year period. Additionally, 149 livers were collected from cull dairy cows at an

abattoir and were analyzed for copper content and for histological evidence of injury. In both studies, copper concentrations were often greater than what is needed for health, but there was no evidence of copper-induced liver injury.

<https://doi.org/10.3168/jds.2018-15566>.

**Comparison of gene editing versus conventional breeding to introgress the POLLED allele into the US dairy cattle population.** *By Mueller et al., page 4215.* Dehorning protects animals and humans from injury but is painful. Breeding for polled (hornless) cattle has not been adopted due to the low genetic merit and scarcity of polled dairy sires. Alternatively, gene editing to produce high-genetic-merit polled sires has been proposed. We simulated the introgression of the POLLED allele into the US dairy cattle population via conventional breeding or gene editing for 20 years. Gene editing only the top 1% of elite artificial insemination sires/year resulted in the POLLED allele being rapidly disseminated while maintaining genetic diversity and genetic progress, which was superior to using existing polled genetics.

<https://doi.org/10.3168/jds.2018-15892>.

**Inbreeding and effective population size in French dairy sheep: Comparison between genomic and pedigree estimates.** *By Rodriguez-Ramilo et al., page 4227.* The genetic diversity of 5 selected French dairy sheep subpopulations and breeds is quantified by 3 different methods (pedigree, SNP-by-SNP, and runs of homozygosity) using a medium-density SNP chip. The effect of factors defining runs of homozygosity is also assessed. Estimates of effective population size were above 200 in Lacaune subpopulations and below 200 in Basco-Béarnaise, Manech Tête Noire, and Manech Tête Rousse breeds. Factors defining runs of homozygosity do not greatly change the results unless extreme values are considered, although further research on runs of homozygosity-based inbreeding is still required.

<https://doi.org/10.3168/jds.2018-15405>.

**Genetic associations of lactose and its ratios to other milk solids with health traits in Austrian Fleckvieh cows.** *By Costa et al., page 4238.* Lactose has been generally considered constant in bovine milk, and very few studies have dealt with estimation of genetic parameters for this trait; however, several factors, including cow health and metabolic status, may induce variation of lactose, which could be exploited at different levels. In the present paper, we assessed the genetic correlations of lactose percentage, ratios of lactose with other milk solids, and lactose yield with most common disorders of dairy cows. Results showed negative phenotypic and genetic correlations between lactose content and mastitis, which are a prelude to the potential use

of lactose in breeding schemes to improve udder health of dairy cows.

<https://doi.org/10.3168/jds.2018-15883>.

**Candidate genes associated with the heritable humoral response to *Mycobacterium avium* ssp. *paratuberculosis* in dairy cows have factors in common with gastrointestinal diseases in humans.** *By McGovern et al., page 4249.* Paratuberculosis in cattle, also commonly known as Johne's disease, causes serious performance and, by extension, economic losses on farms. Its tentative links with Crohn's disease in humans is also of concern. The present study revealed that breeding for differences in humoral response to paratuberculosis in cattle is possible, should routine access to test results be available, and also that the underlying genetic variants contributing to this genetic variation have factors in common with gastrointestinal diseases in humans.

<https://doi.org/10.3168/jds.2018-15906>.

**Phosphorylation of AKT serine/threonine kinase and abundance of milk protein synthesis gene networks in mammary tissue in response to supply of methionine in periparturient Holstein cows.** *By Ma et al., page 4264.* Dairy cows experience some degree of insulin resistance during the periparturient period, especially early lactation, which dictates nutrient utilization by tissues. Enhanced periparturient supply of rumen-protected methionine consistently increases dry matter intake, milk yield, and milk protein yield in dairy cows. The mechanistic target of rapamycin complex 1 (mTORC1) plays a critical role in protein synthesis. Whether changes in mRNA and protein abundance of targets in the insulin signaling and mTORC1 pathway in mammary glands contribute to the response to feeding rumen-protected methionine is unknown. Data suggested that greater phosphorylation status of protein kinase B, upregulation of glucose and amino acid transporters, and transcripts of tRNases contribute to greater milk protein yield even during a period of insulin resistance such as early lactation.

<https://doi.org/10.3168/jds.2018-15451>.

**Short communication: Genetic aspects of milk differential somatic cell count in Holstein cows: A preliminary analysis.** *By Bobbo et al., page 4275.* In the present study, we investigated genetic aspects of a novel indicator of udder health; that is, the milk differential somatic cell count. Our findings offered compelling evidence of the importance of acquiring information about the proportion of the different cell types in milk to better define udder health status. Results demonstrated that differential somatic cell count is a heritable trait, and thus it has the potential to

be considered in selection programs aimed to improve mastitis resistance.  
<https://doi.org/10.3168/jds.2018-16092>.

**Factors associated with dairy farmers' satisfaction and preparedness to adopt recommendations after veterinary herd health visits.** *By Ritter et al., page 4280.* Veterinary consultancy benefits from effective communication. In this study, we assessed associations of predictor variables (i.e., demographics, veterinary communication patterns, and affective attributes) with farmers' satisfaction with veterinarians' consultancy and farmers' preparedness to adopt recommendations. Data capture included on-farm audio-video recordings and questionnaires. Overall, farmers were more positive when a veterinarian counseled more and had regular data discussions, whereas their satisfaction was negatively associated with a veterinarian's dominance and number of questions asked by the farmer. Identification of factors associated with farmers' satisfaction and adoption can inform veterinary practitioners and communication educators to improve interactions with farmers.  
<https://doi.org/10.3168/jds.2018-15825>.

**Automated body condition scoring of dairy cows using 3-dimensional feature extraction from multiple body regions.** *By Song et al., page 4294.* This study investigated the possibility of improving automated scoring of dairy cow body condition, a measure of cow fatness. We recorded the body surfaces of dairy cows using 3-dimensional cameras positioned at multiple viewpoints. Recorded images of a cow were processed automatically to mimic human body condition scoring. Using the extracted body features from multiple body parts of a cow improves the performance of the automated body condition scoring and offers dairy farmers a low-cost method to monitor the body condition of individual cows.  
<https://doi.org/10.3168/jds.2018-15238>.

**Evaluation of test-day milk somatic cell count information to predict intramammary infection with major pathogens in dairy cattle at drying off.** *By Lipkens et al., page 4309.* Test-day somatic cell count data before drying off were explored to evaluate their diagnostic ability to detect an intramammary infection with a major pathogen at the time of drying off in dairy cows. Somatic cell count information derived via milk recording is capable of predicting the absence of intramammary infection with major pathogens at dry-off, yet (an estimate of) the herd prevalence of sub-clinical mastitis, the cow milk yield, and parity affect the estimates of the sensitivity, specificity, and predictive values to some extent.  
<https://doi.org/10.3168/jds.2018-15642>.

**Growth of preweaned, group-housed dairy calves diagnosed with respiratory disease using clinical respiratory scoring and thoracic ultrasound—A cohort study.** *By Cramer and Ollivett, page 4322.* This study measured the effect of ultrasonographic lung consolidation and clinical respiratory disease on dairy calf growth. It is unknown whether both clinical signs and lung ultrasonography must be used to identify calves that may have poor growth. Calves with lung consolidation had a 0.11 kg/d decrease in average daily gain compared with calves without lung consolidation. Calves with clinical respiratory disease had a 0.10 kg/d decrease in average daily gain compared with calves without clinical respiratory disease. Our results suggest that both ultrasonography and clinical scoring systems are necessary to identify all calves that may have poor growth due to respiratory disease.  
<https://doi.org/10.3168/jds.2018-15420>.

**Staphylococcal intramammary infection dynamics and the relationship with milk quality parameters in dairy goats over the dry period.** *By Bernier Gosselin et al., page 4332.* Intramammary infection (IMI) dynamics (persistence, rates of new IMI, and rates of cure) and factors associated with IMI dynamics over the dry period were studied in 200 goats from 3 herds, using udder-half milk culture and somatic cell count data and goat-level characteristics. At the udder-half level, incidence of new IMI over the dry period was 13.2%. Forty-eight percent of staphylococcal IMI detected before dry-off persisted into the next lactation. Although numerical differences were observed, IMI persistence was not associated with staphylococcal species.  
<https://doi.org/10.3168/jds.2018-16030>.

**Associations between on-farm animal welfare indicators and productivity and profitability on Canadian dairies: I. On freestall farms.** *By Villettaz Robichaud et al., page 4341.* Evaluating the associations between dairy cow welfare indicators and farm productivity and profitability is essential to motivate producers to invest in welfare-oriented improvements. The on-farm prevalence of animal-based welfare indicators including lameness, lesions, body condition score, and dirtiness were all significantly associated with either farm productivity measures or profitability margins. Resource- and management-based indicators of cow comfort were also associated with farm profitability and productivity.  
<https://doi.org/10.3168/jds.2018-14817>.

**Associations between on-farm cow welfare indicators and productivity and profitability on Canadian dairies: II. On tiestall farms.** *By Villettaz Robichaud et al., page 4352.* Quantifying the associations between animal welfare and farm produc-

tivity and profitability is essential to motivate dairy farmers to invest toward welfare improvements. Lower prevalence of dirty cows and low body condition score cows was associated with better productivity and profitability. More comfortable stalls and longer lying time were also positively associated with farm profitability margins over replacement costs. The associations between animal-based welfare measures and productivity indicators were often moderated by some management-based measures.

<https://doi.org/10.3168/jds.2018-14818>.

#### **Ultrasonographical examination of bovine claws through the sole horn on weight-bearing claws.**

*By Bach et al., page 4364.* Among other reasons, claw horn lesions are believed to be caused by a sinking of the pedal bone inside the claw capsule, thereby damaging the horn-producing tissue in the sole of claw. In our study, we developed and evaluated an ultrasound-based method that makes it possible to measure the distance between the pedal bone and the sole horn on a weight-bearing claw under practical conditions. We believe this method can be used to investigate whether the pedal bone sinks around calving.

<https://doi.org/10.3168/jds.2018-14803>.

#### **Randomized, controlled, superiority study of extended duration of therapy with an intramammary antibiotic for treatment of clinical mastitis.**

*By McDougall et al., page 4376.* Bacteriological cure following antibiotic treatment of clinical mastitis is less than 100%. Hence, extending the duration of therapy has been advocated as a strategy to increase cure rates. However, in this study, although extending the duration of treatment resulted in a reduced likelihood of retreatment, it had no effect on the bacteriological cure rate. Use of clinical signs of mastitis, both at the time of diagnosis and 4 days later, in conjunction with information about cows' age and days in milk were predictive of bacteriological cure and may provide guidance for producers, under direction from a veterinarian, as to when to extend therapy.

<https://doi.org/10.3168/jds.2018-15141>.

#### **Effect of dietary transition at dry off on the behavior and physiology of dairy cows.**

*By Dancy et al., page 4387.* The objectives of this study were to investigate the effect of dietary transition at dry off on the behavior and physiology of dairy cows and to evaluate the efficacy of reducing dietary nutrient density and milking frequency for drying off cows. Dietary transition at dry off resulted in changes in feeding behavior, rumination, and lying behavior as well as reticulorumen pH, energy balance, and inflammation. A greater reduction in dietary nutrient density, along with milking intermittently, better facilitated a reduction in milk production before dry off.

<https://doi.org/10.3168/jds.2018-15718>.

#### **Methionine supply during the periparturient period enhances insulin signaling, amino acid transporters, and mechanistic target of rapamycin pathway proteins in adipose tissue of Holstein cows.**

*By Liang et al., page 4403.* Enhanced postruminal supply of methionine during the periparturient period increases dry matter intake and alleviates oxidative stress and inflammation status, both of which could benefit insulin sensitivity and help prevent excessive catabolism of tissues such as skeletal muscle and adipose. In nonruminants, adipose tissue is responsive to amino acid supply and can be used as fuels or for protein synthesis, in part via signaling mechanisms encompassing insulin- and mechanistic target of rapamycin (MTOR)-related proteins. The current study revealed that enhanced methionine supply during the periparturient period can regulate abundance of genes and proteins in subcutaneous adipose tissue, with important roles in insulin and MTOR pathway signaling.

<https://doi.org/10.3168/jds.2018-15738>.

#### **Clarifying dairy calf mortality phenotypes through postmortem analysis.**

*By McConnel et al., page 4415.* Without input from a systematic postmortem analysis, it can be difficult to identify the underlying cause of dairy calf mortality based solely on the progression of treatments before death. The inclusion of information from on-farm necropsies and additional laboratory diagnostics can provide the detail necessary to meaningfully categorize causes of death. By more clearly demarcating causes of death, a calf health management team can alter management to prevent, reduce, or eliminate certain health problems.

<https://doi.org/10.3168/jds.2018-15527>.

#### **Infrared thermography and behavioral biometrics associated with estrus indicators and ovulation in estrus-synchronized dairy cows housed in tiestalls.**

*By Perez Marquez et al., page 4427.* Accurate detection of estrus is important for reproductive success. Current estrus detection rates are less than optimal and vary in accuracy depending on type of housing. The objective of this study was to evaluate thermal and behavioral parameters associated with estrus as a noninvasive method of estrus detection. This study found thermal and behavioral differences between pregnant and cyclic cows and that fluctuations in radiated temperature, depending on anatomical location, and tail movements before ovulation were associated with estrus in tiestall-housed multiparous cows.

<https://doi.org/10.3168/jds.2018-15221>.

#### **Intramammary antimicrobial treatment of subclinical mastitis and cow performance later in lactation.**

*By van den Borne et al., page 4441.* We studied the long-term therapeutic effects of antimicrobial treatment of recently acquired subclinical mastitis in Dutch dairy cows based on follow-up data from 2



linked randomized field trials. Antimicrobial treatment of recently acquired subclinical mastitis during lactation resulted in lower composite somatic cell count during the remainder of the lactation, compared with untreated controls. No differences in clinical mastitis or milk yield during the remainder of the lactation were observed. Antimicrobial treatment of cows with recently acquired subclinical mastitis should not be the first choice when trying to improve udder health in dairy herds.

<https://doi.org/10.3168/jds.2019-16254>.

**Relationship between the probability of veterinary-diagnosed bovine mastitis occurring and farm management risk factors on small dairy farms in Austria.** *By Firth et al., page 4452.* This study assessed the level of mastitis in dairy cows on more than 200 small farms (<100 cows) in the Central European country of Austria. Statistical analysis of these farms found that allowing cows regular access to pasture, using an automatic shut-off while milking, and feeding cows immediately after milking reduced the likelihood of udder infections. Mastitis increased when farmers worked only part time on the farm, with cows' age, and when udders were particularly dirty. These results will help to improve dairy cow health and welfare. <https://doi.org/10.3168/jds.2018-15657>.

**Effect of using internal teat sealant with or without antibiotic therapy at dry-off on subsequent somatic cell count and milk production.** *By McParland et al., page 4464.* Treatment and prevention of mastitis are the predominant reasons for antibiotic use in the dairy industry. Traditionally in Ireland and elsewhere, whole-herd antibiotic dry-cow therapy has been commonplace to treat existing infections and prevent new infections during the dry period. As an increasing number of cows are now uninfected at drying-off and concern over antimicrobial resistance mounts, this strategy is now under scrutiny. Results from this study show that cows treated with dry-cow antibiotic therapy plus internal teat sealant at drying-off had lower somatic cell counts across the entire subsequent lactation than cows treated with internal teat sealant alone; however, the difference was relatively small. This indicates that herds with good mastitis control programs can use internal teat sealant alone at drying-off on cows that had somatic cell counts of <200,000 cells/mL throughout the previous lactation, with only small effects on herd somatic cell count.

<https://doi.org/10.3168/jds.2018-15195>.

**Exploring dairy producer and veterinarian perceptions of barriers and motivators to adopting on-farm management practices for Johne's disease control in Ontario, Canada.** *By Roche et al., page 4476.* This study investigated dairy producer

and veterinarian perceptions of Johne's disease control recommendations in Ontario, Canada. We identified physical resources (i.e., time, money, infrastructure) and producer mindset (i.e., perceived priority of Johne's disease, perceived practicality of Johne's disease control recommendations) as key barriers, as well as intrinsic (i.e., pride, responsibility) and extrinsic (i.e., incentives, penalties, extension) motivators. This study highlights the importance of producer mindset in on-farm change and offers insights into the attitudes and perceived barriers influencing on-farm change.

<https://doi.org/10.3168/jds.2018-15944>.

**Management of preweaned bull calves on dairy operations in the United States.** *By Shivley et al., page 4489.* The objective of this study was to survey the management of dairy bull calves on US dairy operations and to compare these practices with the management of heifer calves on the same operations. Differences in colostrum management and dehorning practices between bull calves and heifer calves were found. Bull calves received colostrum later after birth compared with heifer calves, and bull calves were less likely to be dehorned on the operation of origin compared with heifer calves. Increased use of analgesics or anesthetics for all painful procedures in both bull and heifer calves is necessary.

<https://doi.org/10.3168/jds.2018-15100>.

**Evaluation of a multispecies probiotic as a supportive treatment for diarrhea in dairy calves: A randomized clinical trial.** *By Renaud et al., page 4498.* Diarrhea is a common disease in neonatal dairy calves. This trial aimed to evaluate the use of a multispecies probiotic bolus as a supportive treatment of diarrhea. The probiotic reduced the duration of diarrhea, and no differences were found with respect to average daily gain in the first 2 weeks following enrollment. This study suggests that the bolus led to a reduction in the duration of diarrhea; however, further studies are needed to determine the clinical relevance of this finding.

<https://doi.org/10.3168/jds.2018-15793>.

**Space allowance influences individually housed Holstein male calves' age at feed consumption, standing behaviors, and measures of immune resilience before and after step-down weaning.** *By Hulbert et al., page 4506.* Many dairy calves in the Southwest United States are raised in wooden hutches, with 1.23 m<sup>2</sup> of free space, that house 3 calves individually. Hutches were modified to increase space to 1.85 m<sup>2</sup> or 3.71 m<sup>2</sup>; this modification also changed the number of calves housed per hutch to 2 and 1, respectively. Weaning readiness was evaluated using age at solid feed consumption, standing behaviors, and measures of immunity. Calves housed in hutches with 1.85 m<sup>2</sup> of space

appeared to be most ready for weaning initiation and completion based on age at consumption of solid feed and measures of immune resilience.  
<https://doi.org/10.3168/jds.2018-15368>.

**Farm-level risk factors for bovine mastitis in Dutch automatic milking dairy herds.** *By Deng et al., page 4522.* By using a combination of data imputation, regression analysis, and nonlinear principal component analysis, risk factors for bovine mastitis on Dutch dairy farms were evaluated. We found that hygiene of the cows and of the milking machine, farm size, postmilking teat disinfection, as well as farmers' attitude toward udder health are associated with udder health.  
<https://doi.org/10.3168/jds.2018-15327>.

**Technical note: Validation of an ear-tag accelerometer to identify feeding and activity behaviors of tiestall-housed dairy cattle.** *By Zambelis et al., page 4536.* A study was conducted to validate the CowManager SensOor ear-tag accelerometer (Agis Automatisering BV, Harmelen, the Netherlands) against visual observations of feeding, rumination, resting, and active behaviors for use with tiestall-housed dairy cows. The results suggest that the sensor can be used to accurately monitor active and not-active behaviors of tiestall-housed dairy cows for both scientific and management purposes. Although the sensor shows promise for identifying feeding behaviors in general, the independent classification of rumination and eating requires additional sensitivity.  
<https://doi.org/10.3168/jds.2018-15766>.

**Technical note: Automatic evaluation of infrared thermal images by computerized active shape modeling of bovine udders challenged with *Escherichia coli*.** *By Watz et al., page 4541.* Mastitis is a cause of substantial economic loss and animal suffering in the dairy industry. Growing herd sizes complicate udder health monitoring. We investigated an automated method that used infrared thermography as a diagnostic tool, avoiding the time-consuming manual method of evaluation. We found that automatic evaluation of bovine udder thermograms by computerized active shape modeling was a suitable tool to detect clinical *Escherichia coli*-induced mastitis if the thermogram recording was implemented in short intervals (not exceeding 2 h).  
<https://doi.org/10.3168/jds.2018-15761>.

**Profitability of dairy cows submitted to the first service with the Presynch-Ovsynch or Double-Ovsynch protocol and different duration of the voluntary waiting period.** *By Stangaferro et al., page 4546.* We compared cash flow and parameters of economic performance for dairy cows submitted to the

first service using a combination of insemination at detected estrus (EDAI) and timed artificial insemination (TAI) in cows synchronized with the Presynch-Ovsynch (PSOv) protocol versus all TAI after the Double-Ovsynch (DO) protocol, with different duration of the voluntary waiting period. The strategies compared did not result in detectable differences in cash flow, but numerical trends and stochastic simulation indicated that TAI at 88 d in milk after DO, or a combination of EDAI and TAI with PSOv after a voluntary waiting period of 50 d in milk, may be more economically favorable for primiparous cows. For multiparous cows, TAI at 60 d in milk after DO, or the combination of EDAI and TAI with PSOv after a voluntary waiting period of 50 d in milk, may be more economically favorable.  
<https://doi.org/10.3168/jds.2018-15567>.

**Effect of milking stall dimensions on upper limb and shoulder muscle activity in milkers.** *By Cockburn et al., page 4563.* Do enlarged milking stalls that improve cow wellbeing in the milking parlor affect the wellbeing of the milker? To answer this question, we investigated the effect of milking stall dimensions on muscle activity in milkers. We performed this study to ensure that legislation improving animal welfare does not jeopardize human health. The results demonstrated that milking stall dimensions are not the core factor affecting upper limb and shoulder muscle activation during milking.  
<https://doi.org/10.3168/jds.2018-15316>.

**Positive relationships between body weight of dairy heifers and their first-lactation and accumulated three-parity lactation production.** *By Handcock et al., page 4577.* This study investigated the relationships between body weight and milk production of New Zealand dairy heifers. We found positive curvilinear relationships between body weight and first lactation and accumulated milk production over the first 3 lactations. The response to an increase in body weight was greater for lighter heifers compared with heavier heifers, indicating potential benefits of preferentially feeding lighter heifers to attain heavier body weights. Consequently, for heifers that were below average in body weight, considerable milk production benefits accrued over the first 3 lactations by improving rearing practices to result in heavier heifers throughout the precalving phase.  
<https://doi.org/10.3168/jds.2018-15229>.

**Responses to metabolic challenges in dairy cows with high or low milk yield during an extended lactation.** *By Marett et al., page 4590.* Re-breeding was delayed for 12 Holstein-Friesian cows to extend the lactation to up to 670 days. Cows were selected for high or low milk yield at approximately 450 days in milk. Three metabolic challenges (infusions of glucose,

insulin, and epinephrine) were administered at approximately 460 and 580 days in milk. Cows able to sustain greater milk yields during an extended lactation had a lower whole body and peripheral tissue responsiveness to insulin in terms of the fatty acid response. Thus, higher-yielding cows had a greater propensity for lipid mobilization, enhancing nutrient partitioning to the mammary gland at the expense of tissue gain.  
<https://doi.org/10.3168/jds.2018-15513>.

**Integrative plasma proteomic and microRNA analysis of Jersey cattle in response to high-altitude hypoxia.** *By Kong et al., page 4606.* This study showed that the immune function of Jersey cattle decreased in response to high-altitude hypoxia because of reductions in the levels of interleukin-2, interleukin-6, and tumor necrosis factor- $\alpha$ , by inhibiting the acute-phase response and promoting liver X receptor/retinoid X receptor activation.  
<https://doi.org/10.3168/jds.2018-15515>.

**Effect of extended colostrum feeding on plasma glucagon-like peptide-1 concentration in newborn calves.** *By Inabu et al., page 4619.* Glucagon-like peptide-1 (GLP-1) is thought to play an important role in glucose homeostasis. The objective of this study was to evaluate the effects of extended colostrum feeding on plasma GLP-1 concentration in neonatal calves. We determined that extended colostrum feeding may increase plasma GLP-1 concentration, especially 3 d after birth in neonatal calves.  
<https://doi.org/10.3168/jds.2018-15616>.

**Fetuin-A modulates lipid mobilization in bovine adipose tissue by enhancing lipogenic activity of adipocytes.** *By Strieder-Barboza and Contreras, page 4628.* Excessive lipolysis and limited lipogenesis during the periparturient period may predispose cows to disease. Fetuin-A is an adipokine that modulates adipose tissue lipid mobilization in cows; however, the mechanisms behind this response are not characterized. We demonstrate that exposure to fetuin-A attenuates lipolytic responses and enhances fatty acid uptake and triacylglycerol accumulation in bovine adipocytes. In response to fetuin-A, adipocytes upregulate the expression and activity of the rate-limiting lipogenic enzyme 1-acylglycerol-3-phosphate acyltransferase and thus increase their lipogenic rate. Fetuin-A is a potential target for modulation of lipid mobilization and enhancement of lipogenic function in adipose tissue of periparturient dairy cows.  
<https://doi.org/10.3168/jds.2018-15808>.

**Plasma metabolite changes in dairy cows during parturition identified using untargeted metabolomics.** *By Luo et al., page 4639.* The physiological metabolism of dairy cows undergoes substantial changes

from late pregnancy to early lactation. In this study, an untargeted metabolomics approach was used to investigate changes in plasma metabolite response to parturition, compared with the 21st day prepartum. Our results indicate that the levels of several lipids, nucleotides, and saccharides significantly increased after parturition, whereas several amino acids significantly decreased. Pathway analysis revealed that lipid metabolism and gluconeogenesis increased after parturition, whereas amino acid metabolism is decreased. This study provides novel information that will advance our understanding of the metabolic changes in cows during parturition.  
<https://doi.org/10.3168/jds.2018-15601>.

**Genetic merit for fertility traits in Holstein cows: VI. Oocyte developmental competence and embryo development.** *By Moore et al., page 4651.* Poor oocyte quality and embryo mortality have been implicated as major causes of poor fertility in lactating dairy cows. This study examined oocyte quality following ovum pick-up and embryo quality following superovulation, artificial insemination, and uterine flushing in cows with similar genetic merit for milk production but with either good or poor genetic merit for fertility traits. Results indicate that greater fertility in cows with good genetic merit compared with those with poor genetic merit is not determined by the quality of immature oocytes but is partly mediated by their superior embryo quality.  
<https://doi.org/10.3168/jds.2018-15813>.

**Overexpression of miR-101-2 in donor cells improves the early development of Holstein cow somatic cell nuclear transfer embryos.** *By Chang et al., page 4662.* Through overexpression of miR-101-2 in donor cells, we show that miR-101-2 can affect the physiological status of donor cells, thereby reducing apoptotic rate and enhancing the early development of Holstein cow somatic cell nuclear transfer (SCNT) embryos. This study provides a strategy for facilitating improved efficiency of SCNT and would benefit breeding of Holstein cattle.  
<https://doi.org/10.3168/jds.2018-15072>.

**Short communication: Production of antimicrobial peptide S100A8 in the goat mammary gland and effect of intramammary infusion of lipopolysaccharide on S100A8 concentration in milk.** *By Purba et al., page 4674.* In small ruminants, mastitis is still considered to be one of the most important diseases with regard to economics, animal welfare, and food hygiene. One of the antimicrobial peptides, S100A8, has become an interesting research focus, with contribution to the innate immune system. Antimicrobial peptide S100A8 mRNA was expressed in the mammary gland and teat, blood leukocytes, and milk

somatic cells, and S100A8 protein was localized in the leukocytes infiltrated in the mammary gland and teat epithelium after lipopolysaccharide challenge. Furthermore, S100A8 concentration in milk was affected by lipopolysaccharide stimulation. This finding has important implications for controlling mastitis using S100A8. <https://doi.org/10.3168/jds.2018-15396>.

**An income over feed cost nutritional grouping strategy.** *By Wu et al., page 4682.* Multiple ration grouping of lactating cows could improve the milk income over feed cost on dairy farms. Grouping cows by their nutrient requirements (cluster) is the current state-of-the-art nutritional grouping strategy. We developed a new grouping method, OptiGroup, which outperformed the cluster method economically: average extra milk income over feed cost of \$8/cow per yr with 2 groups and \$12/cow per yr with 3 groups. This improvement derived from nutrient savings in ration groups. The OptiGroup had smaller nutrient density differences between ration groups than the cluster method. <https://doi.org/10.3168/jds.2018-15302>.

**Fecal particle dry matter and fiber distribution of heifers fed ad libitum and restricted with low and high forage quality.** *By Kljak et al., page 4694.* This study was designed to explore the effect of diet manipulations (feeding regimen, forage quality, and fiber content) and sampling techniques (grab sampling and total fecal collection) on fecal particle dry matter, neutral detergent fiber, and starch distribution on Nasco Digestion Analyzer (NDA) sieves (Fort Atkinson, WI). Distributions of analyzed nutrients were affected by forage quality, dietary fiber content, and sampling time, whereas feeding regimen and sampling day showed no effect. Fecal grab samples taken only at 12 hours after feeding produced results for dry matter and neutral detergent fiber distribution on NDA sieves from dairy heifers that closely represented the average daily fecal output. Although individual fecal grab samples may not represent a true summary of the daily fecal output from heifers, a representative sample made of several grab samples throughout day will. <https://doi.org/10.3168/jds.2018-15457>.

**Proposed dairy calf birth certificate data and death loss categorization scheme.** *By Lombard et al., page 4704.* Death loss in dairy calves is primarily due to stillbirths, failure to adapt to extrauterine life, and infectious diseases. Recording of calf deaths currently provides limited information. Producers could gather information about the circumstances near birth and at death if they had appropriate guidance on what details to record and monitor. This paper provides recommendations on data to collect at the time of birth that is influential for the future health of the calf. Additionally, we propose a death loss categorization scheme that more clearly delineates causes of death that can be analyzed and appropriately managed. <https://doi.org/10.3168/jds.2018-15728>.

**Symposium review: Intramammary infections—Major pathogens and strain-associated complexity.** *By Keane, page 4713.* A range of different microorganisms can cause mastitis; *Staphylococcus aureus*, *Streptococcus uberis*, and *Escherichia coli* are among the most common. Within each of these bacterial species, a variety of strains adapted to cause intramammary infection have been identified. The influence of the species and strain of the infecting organism on the host response to mastitis and infection outcome is reviewed. Strategies to control mastitis will benefit from an improved understanding of the bacterial virulence factors required to cause intramammary infection and how they interact with the bovine immune response. <https://doi.org/10.3168/jds.2018-15326>.

**Symposium review: Features of *Staphylococcus aureus* mastitis pathogenesis that guide vaccine development strategies.** *By Côté-Gravel and Malouin, page 4727.* In this review, we summarize key concepts related to the pathogenesis of *Staphylococcus aureus* as well as its interaction with the host and describe the recent development of new vaccination strategies against *Staph. aureus* mastitis. Currently, no commercially available vaccine formulation demonstrates sufficient protection and cost-effective potential. <https://doi.org/10.3168/jds.2018-15272>.