**Invited review:** Mineral absorption mechanisms, mineral interactions that affect acid–base and antioxidant status, and diet considerations to improve mineral status. By Goff, page 2763. This review highlights the mechanisms used by the body to obtain minerals from the diet and the factors found in the diet that can interfere with absorption of minerals across the digestive tract. Minerals that are absorbed play a major role in acid–base physiology, and the role dietary cations and anions play in the strong ion difference of the blood is explored. During metabolism many reactive oxygen species can be generated. Minerals play an important role in antioxidant mechanisms. However, when fed to excess they can also generate free radicals. https://doi.org/10.3168/jds.2017-13112.

**Hot topic:** Holder pasteurization of human milk affects some bioactive proteins. By Guerra et al., page 2814. Holder pasteurization causes reduction of glutathione peroxidase activity in human milk, but lysozyme activity is not affected. Holder pasteurization also causes changes in lactoferrin and immunoglobulin–protein profiles. Human milk banks should add glutathione peroxidase activity inactivated by Holder pasteurization to recover this lost functionality of milk. https://doi.org/10.3168/jds.2017-13789.

**Randomized double-blind controlled clinical trial of the blood pressure–lowering effect of fermented milk with Lactococcus lactis: A pilot study.** By Beltrán-Barrientos et al., page 2819. In vitro and in vivo studies have revealed that fermented milk with Lactococcus lactis NRRL B-50571 may generate antihypertensive bioactive peptides. Hence, we evaluated the blood pressure–lowering effect of fermented milk with L. lactis NRRL B-50571 in a double-blind randomized controlled clinical trial with prehypertensive subjects. Results revealed that after daily consumption of fermented milk, systolic and diastolic blood pressures were lower than those in the control group. This product may be regularly consumed as a potential functional food. https://doi.org/10.3168/jds.2017-13189.

**Short communication:** Probiotic induction of interleukin-10 and interleukin-12 production by macrophages is modulated by co-stimulation with microbial components. By Kaji et al., page 2838. Some probiotics activate the host immune defense to prevent infections and cancers, whereas others downregulate excessive immune responses to avoid inflammatory diseases. Cytokines induced by probiotics, particularly IL-10 and IL-12, are considered to be crucial for determining the direction of the immune response. Our present data suggest that the IL-10– and IL-12–inducing ability of probiotics is not fixed but rather can be flexibly modified by microbial components provided by gut microbiota and others. https://doi.org/10.3168/jds.2017-13868.

**Characterization and milk coagulating properties of Cynanchum otophyllum Schneid. proteases.** By Luo et al., page 2842. Milk cake is a traditional milk product that has been consumed for hundreds of years in Asia. Cynanchum otophyllum Schneid. has long been used to prepare solutions for use as a coagulant to make milk cake. However, the composition of milk-clotting proteases from this plant and their coagulation mechanism still remain unclear. We aimed to purify the C otophyllum proteases and reveal their milk clotting characteristics. Understanding these characteristics could contribute to the development of a plant rennet that would promote the industrial production of milk cake. https://doi.org/10.3168/jds.2017-13888.

**Short communication:** Development of a rapid laboratory method to polymerize lactose to nondigestible carbohydrates. By Kuechel and Schoenfuss, page 2862. Acid-catalyzed polymerization of sugars, such as lactose, to oligosaccharides potentially is a way to produce nondigestible carbohydrates. Lactose-containing ingredients such as whey permeates have components that inhibit polymerization. A laboratory microwave method was developed that allows for investigation of the effects of formula constituents on oligosaccharide yield. The effects of moisture and calcium on oligosaccharide yield were evaluated. Increasing acid catalyst counteracted the inhibition by calcium with both pure sugars and whey permeate. The microwave method was found to correctly predict...
olsosaccharide yields observed when extrusion trials were conducted. 

**Whole-genome sequencing reveals the mechanisms for evolution of streptomycin resistance in Lactobacillus plantarum.** By Zhang et al., page 2867. In this study, combination of laboratory evolution and whole-genome sequencing was used to study evolution of the streptomycin resistance in Lactobacillus plantarum ATCC14917. Bioinformatic analysis of the high-throughput sequencing data showed that 5 gene mutations are detected in L. plantarum ATCC14917 following passage in streptomycin compared with the controls, which may explain the high resistance to streptomycin in L. plantarum ATCC14917. This research offers a way for selecting the isolates with high antibiotic resistance and evaluating antibiotic resistance and the adaptation mechanism in L. plantarum. 

**Characterization of a cryptic plasmid isolated from Lactobacillus casei CP002616 and construction of shuttle vectors based on its replicon.** By Song et al., page 2875. We studied the characterization of cryptic plasmid pLC2W and constructed a new expression vector that can be used in different lactobacilli. We also tried 2 methods to cure the cryptic plasmid and explained the relationship between plasmid and exopolysaccharide synthesis.

**Technological characterization of Lactobacillus in semihard artisanal goat cheeses from different Mediterranean areas for potential use as nonstarter lactic acid bacteria.** By Meng et al., page 2887. Lactobacillus strains in semihard artisanal goat cheeses from different Mediterranean areas were characterized for use as nonstarter lactic acid bacteria. Goat cheese is gaining popularity because of its unique taste and flavor. Nonstarter lactic acid bacteria mainly consist of lactobacilli; however, limited knowledge regarding their exact composition hinders their application in industrial cheese manufacture. Twenty-five Lactobacillus strains were isolated from different artisanal goat milk cheeses, among which we identified 4 strains as promising candidates for nonstarter lactic acid bacteria.

**Identification and proteolytic activity quantification of Pseudomonas spp. isolated from different raw milks at storage temperatures.** By Meng et al., page 2897. Pseudomonas spp. are frequently linked to spoilage of raw milk under storage temperatures. Our results showed that many Pseudomonas spp. isolated from goat, buffalo, camel, and yak milks exhibited extracellular peptidase activity under storage temperatures ranging between 2 and 25°C. However, proteolytic activity varied widely among the peptidase-positive isolates. Pseudomonas spp. contribute to reduce the quality of bovine milk as well as nonbovine milk.

**Frequency of extended-spectrum β-lactamase (ESBL)– and AmpC β-lactamase–producing Enterobacteriaceae in a cheese production process.** By Özdikmenli Tepeli and Demirel Zorba, page 2906. Antibiotic resistance is a major public health threat. Extended-spectrum β-lactamase (ESBL)– and AmpC β-lactamase–producing bacteria may transfer to humans via direct contact with infected humans and contaminated medical equipment as well as via the food chain. The objective of this study was to investigate the ESBL and AmpC β-lactamase activity of Enterobacteriaceae isolated from a cheese production line and to determine the probability of transmitting these bacteria to consumers. Among the 173 samples, 4.64 and 15.6% of samples contained ESBL– and AmpC β-lactamase–producing isolates, respectively.

**Short communication: Characterization of Staphylococcus aureus isolated along the raw milk cheese production process in artisan dairies in Italy.** By Johler et al., page 2915. Staphylococcus aureus is the most prevalent cause of foodborne illness worldwide. Data on Staph. aureus isolated from artisanal raw milk cheese productions are scarce even though outbreaks caused by consumption of raw milk and artisanal cheeses were reported. In this study, we determined the population structure and enterotoxin gene profiles of Staph. aureus isolated from raw milk cheeses and artisanal cheese productions in Italy. Our findings show that enterotoxigenic Staph. aureus strains frequently occur in small-scale raw milk cheese productions and artisanal raw milk cheese, demonstrating the need for controlling growth and enterotoxin formation of Staph. aureus along the production chain.

**Short communication: A comparison of biofilm development on stainless steel and modified-surface plate heat exchangers during a 17-h milk pasteurization run.** By Jindal et al., page 2921. Bacterial fouling that occurs during various stages of milk processing poses a great challenge in superior-quality dairy products with long shelf life. Plate heat exchangers generally show fouling and bacterial buildup, especially in the regeneration section during long runs. The frequent cleaning of plate heat exchangers calls for extra labor and proves to be rather expensive and time consuming. A modified surface that supports minimal
attachment and biofilm formation would offer an opportunity for uninterrupted processing with reduced cross-contamination of milk being processed. The focus of this study was to compare native stainless steel and Ni-P-polytetrafluoroethylene modified surfaces for the extent of biofouling and shedding of bacteria when examined over 17-h pasteurization runs. https://doi.org/10.3168/jds.2017-14028.

Effects of microwave on extracellular vesicles and microRNA in milk. By Zhao et al., page 2932. This study demonstrates the effects of microwaves on the microRNA content of milk and milk extracellular vesicles. These results may contribute to improvements in milk processing and a healthy human diet in the future. https://doi.org/10.3168/jds.2016-12021.

Effects of fat content, pasteurization method, homogenization pressure, and storage time on the mechanical and sensory properties of bovine milk. By Li et al., page 2941. This research evaluated the effect of pasteurization conditions, fat content, homogenization pressure, and storage time on bovine milk mechanical properties and sensory properties. Fat content had the greatest effect on milk viscosity and tribological behaviors, whereas pasteurization conditions, storage time, and homogenization pressure had no significant effect. Instrumental and sensory viscosity correlated strongly; friction behavior and astringency were weakly correlated. https://doi.org/10.3168/jds.2017-13568.

The effect of rework content addition on the microstructure and viscoelastic properties of processed cheese. By Černíková et al., page 2956. Rework is a usual part of the raw material of processed cheese. This work studied the effect of rework content at an age of 72 h on the consistency of processed cheeses. If the quantity of rework added was under 10.0%, the increasing amount of rework added caused a gradual increase in the firmness of the processed cheeses; simultaneously, the size of the fat droplets gradually decreased. As the rework concentration in the raw material composition increased further (from 10.0 to 20.0% wt/wt), the firmness of the processed cheeses and the size of the fat droplets no longer increased and differed. The outcomes of this could lead to optimization of rework addition into raw material for processed cheese production. https://doi.org/10.3168/jds.2017-13742.

Immobilization of whole cells of Lactococcus lactis containing high levels of a hyperthermostable β-galactosidase enzyme in chitosan beads for efficient galacto-oligosaccharide production. By Yu and O’Sullivan, page 2974. This study converts a whole-cell enzyme technology into a reusable and food-grade technology for efficient galacto-oligosaccharide production. The study also investigates the effect of high temperature on both alginate and chitosan for whole-cell encapsulation. Furthermore, while synthetic and recombinant DNA were used to obtain the Lactococcus lactis cells full of the hyperthermostable β-galactosidase enzyme, an approach to degrade the DNA without compromising the integrity of the enzyme prior to encapsulation was developed. This application for encapsulating enzymes for very high temperature applications should be applicable for other enzyme applications. https://doi.org/10.3168/jds.2017-13770.

Effect of temperature on the microstructure of fat globules and the immunoglobulin-mediated interactions between fat and bacteria in natural raw milk creaming. By D’Incecco et al., page 2984. Natural creaming, the first step of Grana Padano and Parmigiano Reggiano cheese making, can be carried out at varying temperatures to maximize skimming. This work shows how selected temperatures, or successive combinations of temperature, change the microstructure of fat globules, a factor known to affect final cheese microstructure. This study also identifies the immunoglobulin classes that mediate interactions between fat globules and bacteria, helping to explain the naturally occurring variations in milk debacterization during creaming and offering a route to optimize debacterization. Overall, this study will help cheesemakers optimize creaming and decrease late blowing defects in ripened cheese. https://doi.org/10.3168/jds.2017-13580.

Effect of pH on dissociation of casein micelles in yak skim milk. By Yang et al., page 2998. The effect of pH in the range of 4.6 to 8.2 on the dissociation of casein micelles in yak skim milk was evaluated by scanning electron microscopy, particle size, fluorescence properties, and content of soluble minerals and casein molecules. During acidification, colloidal calcium phosphorus dramatically disassociated from casein micelles, but the casein monomer content of the supernatant decreased slightly. During alkalization, the soluble carbon dioxide-equivalent emissions and water use in the production of whey spirits and white whiskey. By Risner et al., page 2963. This study provides an environmental justification for the production of a craft spirit processed from whey produced by arti-
calcium and phosphorus content decreased up to pH 6.8 but increased with further pH increases. Yak skim milk showed pH-dependent intrinsic and 
8-anilino-1-naphthalenesulfonic acid sodium salt fluorescence properties. However, yak casein micelles maintained their size and individuality at pH 5.4 to 8.2.

Effect of adding clay with or without a *Saccharomyces cerevisiae* fermentation product on the health and performance of lactating dairy cows challenged with dietary aflatoxin B1. By Jiang et al., page 3008. The objective of this study was to examine the effect of supplementing bentonite clay with or without a *Saccharomyces cerevisiae* fermentation product on the performance and health of dairy cows challenged with aflatoxin B1. Both sequestering agent treatments decreased the transfer of dietary aflatoxin to milk, but only the combination of clay and *Saccharomyces cerevisiae* fermentation product prevented the decrease in milk yield caused by the toxin.

Effect of dietary fish oil supplements alone or in combination with sunflower and linseed oil on ruminal lipid metabolism and bacterial populations in lactating cows. By Kairenius et al., page 3021. The effects of fish oil and plant-derived 18:2n-6 or 18:3n-3 on ruminal polyunsaturated fatty acid (PUFA) metabolism and microbes were examined. Fish oil increased omasal flow of 16- to 22-carbon trans PUFA. Plant oils plus fish oil increased trans-18:1 and trans-10 18:1 relative to fish oil, whereas 18:3n-3 resulted in the highest trans-18:2 and 20- to 22-carbon PUFA flow. Compared with fish oil, the biodehydrogenation of 22:6n-3 was more extensive on 18:2n-6 and 18:3n-3, whereas the effect on 22:5n-3 biodehydrogenation depended on the source of 18-carbon PUFA. Altered ruminal PUFA metabolism was not accompanied by major changes in bacterial populations.
https://doi.org/10.3168/jds.2017-13776.

Effects of feeding hulled and hull-less barley with low- and high-forage diets on lactation performance, nutrient digestibility, and milk fatty acid composition of lactating dairy cows. By Yang et al., page 3036. Hulled and hull-less barley grains are cereal grains that can be used as an energy source for high-producing lactating cows. In this study, we evaluated the lactation performance and nutrient utilization of high-producing dairy cows by feeding hulled or hull-less barley grain-based diets with different forage-to-concentrate ratios. Barley grains were ground and incorporated into concentrate pellets at a commercial feed mill. Concentrate pellets were mixed with corn silage and alfalfa hay and delivered ad libitum as a TMR. Cows fed hulled or hull-less barley–based diets with different forage-to-concentrate ratios had similar lactation performances. As milk fatty acid composition was minimally affected by the diets, we concluded that a substantial or dramatic milk fat depression should not be expected when feeding diets containing 30% barley or less as the grain source.

Long-term palmitic acid supplementation interacts with parity in lactating dairy cows: Production responses, nutrient digestibility, and energy partitioning. By de Souza and Lock, page 3044. The objective of our study was to evaluate the effects of long-term palmitic acid (C16:0) supplementation and parity on production, nutrient digestibility, and energy partitioning of mid-lactation dairy cows. We observed that feeding a C16:0 supplement consistently increased NDF digestibility, milk fat yield, ECM, and feed efficiency of mid-lactation dairy cows. In addition, palmitic acid supplementation interacted with parity, with production responses increased to a greater extent in multiparous cows than in primiparous cows when PA was fed.

Bacterial and fungal communities, fermentation, and aerobic stability of conventional hybrids and brown midrib hybrids ensiled at low moisture with or without a homo- and heterofermentative inoculant. By Romero et al., page 3057. Corn silage is one of the most important livestock feeds. Inoculation with beneficial lactic acid bacteria is one strategy to minimize the risk of spoilage and to ensure optimal fermentation. We evaluated the effects of adding a combination bacterial inoculant to several corn hybrids harvested at lower moisture concentrations than recommended. We found that inoculant addition improved corn silage aerobic stability for all but 1 hybrid by producing a distinct and consistent shift in the bacterial and fungal communities present in the ensiled whole-crop corn.

Temporal effects of ruminal propionic acid infusion on feeding behavior of Holstein cows in the postpartum period. By Maldini and Allen, page 3077. Propionic acid produced by fermentation in the rumen can stimulate satiety and reduce energy intake of cows. The rate of propionic acid production is highly variable and easily manipulated by altering diet starch concentration and fermentability. We conducted this experiment to determine the temporal effects of propionic acid supply to the rumen on feeding behavior of cows in the postpartum period. Results of this work will help to elucidate the mechanisms that control feed...
intake in dairy cows and improve our ability to formulate rations to maximize energy intake. 

**Graded substitution of grains with bakery by-products modulates ruminal fermentation, nutrient degradation, and microbial community composition in vitro.** *By Humer et al., page 3085.* The effect of the gradual replacement of cereal grains with bakery by-products on ruminal fermentation and microbiota was investigated in vitro. The diets consisted of hay and concentrate mixture with either 45% cereal grains or bakery by-products, whereby 15, 30, or 45% of bakery by-products were used in place of cereal grains. The inclusion of bakery by-products linearly enhanced degradability of starch while decreasing crude protein and fiber degradability. The inclusion of bakery by-products up to 30% had no detrimental effects on pH, fiber degradability, and microbial diversity, whereas based on the current results the highest inclusion level (45%) cannot be recommended. 

**Effect of delaying colostrum feeding on passive transfer and intestinal bacterial colonization in neonatal male Holstein calves.** *By Fischer et al., page 3099.* A main contributor to failure of passive transfer of IgG in calves is delay in the first colostrum feeding beyond 6 h after birth. How delayed feeding affects intestinal bacterial colonization in the neonatal dairy calf is unknown. The present study determined that delaying colostrum feeding to 6 or 12 h of life decreases the passive transfer of IgG and tends to decrease the prevalence of colon mucosa attached beneficial bacteria. This suggests that delaying colostrum feeding can hinder the efficient absorption of IgG and may affect microbial colonization in the neonatal calf. 

**Short communication: Comparison of a palmitic acid-enriched triglyceride supplement and calcium salts of palm fatty acids supplement on production responses of dairy cows.** *By de Souza and Lock, page 3110.* The objective of our study was to evaluate the effects of feeding a palmitic acid–enriched triglyceride supplement or a calcium salts of palm fatty acid supplement on nutrient digestibility and production responses of mid-lactation dairy cows. We observed that calcium salts of palm fatty acid supplements have higher digestibility than palmitic acid triglyceride supplements but that the difference is smaller than previously reported in the literature for hydrogenated fat supplements. Feeding a palmitic acid–enriched triglyceride supplement increased milk energy output due to increased yields of milk and milk fat, whereas feeding a calcium salts of palm fatty acid supplement increased energy partitioned to body reserves. 

**Short communication: Field study to investigate the associations between herd level risk factors for milk fat depression and bulk tank milk fat percent in dairy herds feeding monensin.** *By McCarthy et al., page 3118.* The objective was to identify univariable relationships between herd-level milk fat depression risk factors and bulk tank milk fat percentage in an observational study on 79 commercial dairy herds in the northeast and upper Midwestern United States that were feeding monensin. No single TMR characteristic or diet component accounted for more than 11% of the variation in herd-level milk fat percentage. The lack of strong relationships between individual risk factors and herd milk fat suggests that many factors contribute to milk fat depression, and herds experiencing low milk fat will need to examine many potential risk factors when working to troubleshoot this challenge. 

**Use of meta-analyses and joint analyses to select variants in whole genome sequences for genomic evaluation: An application in milk production of French dairy cattle breeds.** *By Teissier et al., page 3126.* The 1000 Bull Genome Project provides access to millions of variants—potentially including the causative ones for traits of economic importance—for thousands of animals. This resource opens up new possibilities for the improvement of genomic evaluation of cattle through the inclusion of more, and more relevant, variants. In this study, different multibreed approaches were applied in order to identify candidate mutations related to milk production traits. Genomic evaluation was then used to determine the relative ability of each approach to detect relevant mutations. 

**Genome-wide association analyses based on a multiple-trait approach for modeling feed efficiency.** *By Lu et al., page 3140.* Selection for higher feed efficiency in dairy cattle is important for economic and environmental sustainability. Genome-wide association analyses based on the use of high-density genetic markers are useful for locating genomic regions potentially including important causal mutations affecting feed efficiency. We formally demonstrate, using a multiple-trait genome-wide association analysis on the key component traits of feed efficiency, that genomic regions affecting residual feed intake, or a similar measure thereof, are not likely to be the same as those regions important for its constituent energy sink traits such as milk energy and metabolic BW because of clearly defined orthogonal relationships between some of these traits. Conversely, genome-wide association on DMI is far more likely to be driven by dependent relationships on these same energy sink traits such that genome-wide association on DMI and residual feed intake should generally lead to substantially different associations. 
https://doi.org/10.3168/jds.2017-13364.
Detection of evaluation bias caused by genomic preselection. By Tyrisévä et al., page 3155. Genomic preselection of young bulls not accounted for in the national evaluation model caused a moderate decrease in estimated genetic variance and a clear deviation from zero in estimated Mendelian sampling means. The latter information can be utilized by a new test developed recently to validate the consistency of Mendelian sampling variance of the national evaluation models of Interbull member countries. The study showed that the lower the heritability for the trait, the stronger the bias in estimated breeding value and Mendelian sampling means and variances in bulls. Practically no effect on Mendelian sampling means or genetic variances could be found in the daughters of genomically preselected bulls.


Phenotypic and genetic relationships between indicators of the mammary gland health status and milk composition, coagulation, and curd firming in dairy sheep. By Pazzola et al., page 3164. The present study investigated 3 milk traits in sheep species related to udder subclinical inflammation and their effects on milk composition and coagulation processes. The data set obtained from the sampling of 1,114 Sarda ewes showed that high levels of somatic cells and pH and low lactose concentration were linked to the worsening of milk coagulation. These traits, easily available during milk recording schemes, could be used as potential indicator traits for improving cheese-making ability of ovine milk.


Combining genetic and physiological data to identify predictors of lifetime reproductive success and the effect of selection on these predictors on underlying fertility traits. By Dennis et al., page 3176. Fertility is a key driver of a profitable dairy system. Genetic selection is an important method of improving cow fertility, but it is costly and time prohibitive to validate novel predictors of lifetime reproductive success in an industry setting. Here, we have created a computer model that combines genetic and physiological data to simulate the recording of predictor traits for cow fertility. We have identified simple predictor traits to identify high-fertility sires for improving the reproductive success of dairy heifers by examining a cross-section of heifers on 1 farm. Species distribution based on body site location did not differ for most species. For many species, the probability of isolation changed with age. This study provides insight into the ecology of staphylococcal species involved in heifer mastitis.


Establishing blood gas ranges in healthy bovine neonates differentiated by age, sex, and breed type. By Dillane et al., page 3205. The majority of illness and death in calves occurs within the first 30 d of life. Blood gas analysis is the most accurate method to evaluate the degree and nature of electrolyte imbalance and acid–base disorders in ill calves. Utilizing accurate and tailored reference ranges facilitates precise diagnosis and degree of ill health in neonates. This study assessed the influence of various environmental and genetic factors on the blood gas values of healthy bovine neonates. The results indicate that age, sex, and breed type in particular influence the mean and range of blood gas values. New reference ranges, based on these factors, are proposed.


Cross-sectional study to identify staphylococcal species isolated from teat and inguinal skin of different-aged dairy heifers. By Adkins et al., page 3213. Staphylococci are a common cause of intramammary infection (IMI) in dairy heifers. For some species, isolation from body sites has been shown to increase the odds of developing an IMI. The purpose of this study was to describe the prevalence and distribution of staphylococcal species on the teat and inguinal skin of heifers by examining a cross-section of heifers on 1 farm. Species distribution based on body site location did not differ for most species. For many species, the probability of isolation changed with age. This study provides insight into the ecology of staphylococcal species involved in heifer mastitis.


Effects of difructose anhydride III on serum immunoglobulin G concentration and health status of newborn Holstein calves during the preweaning period. By Htun et al., page 3226. Effects of difructose anhydride III (a plant-derived, nondigestible oligosaccharide) supplementation for 7 d after birth on serum immunoglobulin G (IgG) concentration and health status of newborn Holstein calves during the preweaning period were investigated. The group receiving difructose anhydride III had increased colostral IgG absorption and higher serum IgG concentration until changes indicative of pain, but the practice is commonly performed without pain relief. Our objective was to evaluate the effects of isoflurane and meloxicam on goat kid behavior and physiology following cautery disbudding. Isoflurane alone, or in combination with meloxicam, reduced plasma cortisol concentrations and the frequency of head and body shakes in disbudded kids to levels of sham-handled kids. Pain relief could be used to improve the welfare of dairy goat kids.


Effect of isoflurane alone or in combination with meloxicam on the behavior and physiology of goat kids following cautery disbudding. By Hempstead et al., page 3193. Cautery disbudding of goat kids can cause behavioral and physiological changes indicative of pain, but the practice is commonly performed without pain relief. Our objective was to evaluate the effects of isoflurane and meloxicam on goat kid behavior and physiology following cautery disbudding. Isoflurane alone, or in combination with meloxicam, reduced plasma cortisol concentrations and the frequency of head and body shakes in disbudded kids to levels of sham-handled kids. Pain relief could be used to improve the welfare of dairy goat kids.
21 d of age, but there was no effect on incidence of diarrhea and respiratory disease during the preweaning period. https://doi.org/10.3168/jds.2017-13541.

Udder health in Canadian dairy heifers during early lactation. By Ali Naqvi et al., page 3233. Determining the occurrence of mastitis in heifers is important for improving the overall health and productivity of the dairy herd. In 91 Canadian dairy herds, although the overall incidence of mastitis was lower in heifers than in multiparous cows, udder infections were actually more common in heifers. In the first 30 d after calving, clinical mastitis occurred in 4% of heifers, 14% had a high SCC, and 33% of udder quarters had an infection. Despite different exposures before calving, the distribution of bacteria causing udder infections did not differ between heifers and multiparous cows. https://doi.org/10.3168/jds.2017-13579.

Effects of reduced intramammary antimicrobial use during the dry period on udder health in Dutch dairy herds. By Vanhoudt et al., page 3248. Following a ban on the preventive use of antimicrobials, dry cow therapy in the Netherlands changed from mainly blanket to selective antimicrobial dry cow therapy. In this study, we measured the effect of this change in dry cow therapy on udder health performance at both the herd and cow levels. We found that dry cow therapy without antimicrobials in cows with a low risk of developing an intramammary infection during the dry period reduced the use of antimicrobials without significant changes to udder health performance. https://doi.org/10.3168/jds.2017-13555.

Effect of milk cessation method at dry-off on behavioral activity of dairy cows. By Rajalaschultz et al., page 3261. The objective of this study was to assess the effect of milk cessation method and milk yield at dry-off on dairy cow activity. Daily lying time, lying bout length, and number of lying bouts and steps were monitored for 2 wk before and after dry-off among abruptly and gradually (1× milking/d for the final week) dried-off cows. Gradual cows produced less milk at dry-off. Higher milk production decreased lying times after dry-off, more so among primiparous cows than older cows. Gradual cessation improved cow comfort by reducing milk yield prior to dry-off, especially among high-producing and primiparous cows. https://doi.org/10.3168/jds.2017-13588.

Salmonella enterica and extended-spectrum cephalosporin-resistant Escherichia coli recovered from Holstein dairy calves from 8 farms in New Brunswick, Canada. By Auvosile et al., page 3271. We determined the frequency of fecal carriage, resistance genes, and risk factors associated with extended-spectrum cephalosporin (ESC) resistance in Salmonella enterica and Escherichia coli isolated from feces of dairy calves. Salmonella enterica recovery was low and ESC-resistant E. coli was high using selective culture. The BlaCMY-2 and blaTEM genes, conferring resistance to ESC, were the most prevalent genes found in E. coli isolates. Calf age, regular ceftiofur use on the farm, and waste milk feeding were positively associated with fecal recovery of ESC-resistant E. coli, whereas ceftiofur use for the treatment of respiratory diseases was negatively associated. This study provides information on ESC resistance genes recovered from dairy calves within this region. https://doi.org/10.3168/jds.2017-13277.

Differential effects of a single dose of oral calcium based on postpartum plasma calcium concentration in Holstein cows. By Leno et al., page 3285. Hypocalcemia is a disorder resulting from sudden changes in Ca demand at the onset of lactation that can negatively affect health and performance of dairy cows. Supplementation with oral Ca boluses can be implemented to alleviate hypocalcemia. This study demonstrated that improved health in cows administered a single dose of an oral Ca bolus was dependent on periparturient risk factors such as increasing age, BCS, and lameness. Responses to supplemental Ca were not dependent on Ca status for primiparous cows. Multiparous cows with low blood Ca that received supplemental Ca had improved health status in early lactation. https://doi.org/10.3168/jds.2017-13164.

Feed intake and behavior of dairy goats when offered an elevated feed bunk. By Neave et al., page 3303. Goats are browsers, meaning they consume feed that is elevated off the ground. In commercial systems this feeding behavior is typically not permitted. The aim of this study was to determine how feed intake and feeding behavior vary when goats are offered feed at variable heights. We found that goats eat and compete more at an elevated-level feeder compared with feeders that are head and floor level, and we found that goats visited the floor-level feeder less often compared with other feeder heights. Dairy goats may benefit from the opportunity to feed from raised feeders. https://doi.org/10.3168/jds.2017-13934.

Antimicrobial consumption on dairy herds and its association with antimicrobial inhibition zone diameters of non-aureus staphylococci and Staphylococcus aureus isolated from subclinical mastitis. By Stevens et al., page 3311. Antimicrobial consumption on dairy herds was quantified and the association with inhibition zone diameters, used as proxy for antimicrobial resistance, of non-aureus staphylococci and Staphylococcus aureus isolated from subclinical mastitis cases was studied. For human health, critically important antimicrobials counted for one-third of the
total antimicrobial consumption. The majority of the antimicrobials used were intramammary. Inhibition zone diameters of non-<i>aureus</i> staphylococci for ceftiofurone were negatively associated with the antimicrobial treatment incidence for systemic therapy of critically important ß-lactam antimicrobials and positively associated with the antimicrobial treatment incidence for intramammary therapy of (sub)clinical mastitis of critically important ß-lactam antimicrobials. The inhibition zone diameters for neomycin of non-<i>aureus</i> staphylococci and <i>Staph. aureus</i> originating from the same herds were positively associated.


**How benchmarking motivates farmers to improve dairy calf management.** By Sumner et al., page 3323. Farmers were interviewed before and after receiving benchmarking reports that conveyed information on transfer of immunity and calf growth comparing their own calves with those on other farms in their region. Having access to data on their calves was seen positively, allowing farmers to evaluate how their calves were growing and identify problems in colostrum delivery.


**Tolerance to bovine clinical mastitis: Total, direct, and indirect milk losses.** By Detilleux, page 3334. Mastitis is a common disease of dairy herds in many countries that has damaging effects on milk yield. Milk loss may be directly due to the detrimental effects of the pathogens or indirectly due to the effects of the host response after infection. Here, milk loss was mostly mediated by the increase in milk somatic cell count, which ratifies the use of drugs that limit damage caused by somatic cells. Milk loss varied across individuals, especially during the recovery period, during which epigenetic regulation of macrophage polarization occurs. This also may guide the choice of preventive and curative measures against mastitis.


**Phenotypic and genotypic characterization of antimicrobial resistance profiles in *Streptococcus dysgalactiae* isolated from bovine clinical mastitis in 5 provinces of China.** By Zhang et al., page 3344. This is the first comprehensive report on both phenotypic and genotypic antimicrobial resistance profiles of *Streptococcus dysgalactiae* isolated from 1,180 milk samples from bovine clinical mastitis belonging to 74 commercial dairy herds located in 14 provinces of China from January 2014 to May 2016. Overall, 7.5% of the clinical mastitis cases were caused by <i>S. dysgalactiae</i>. Eighty-two (93.2%) isolates expressed resistance to more than 1 antimicrobial agent. All isolates carried at least 1 of all tested resistance genes. A significant association was found between the presence of the <i>ermB</i> and survival of the *S. dysgalactiae* isolates at increasing erythromycin concentrations.


**Imidazole decreases the ampicillin resistance of an *Escherichia coli* strain isolated from a cow with mastitis by inhibiting the function of autoinducer 2.** By Yu et al., page 3356. The extended spectrum ß-lactamases-positive *Escherichia coli* is a major etiological organism responsible for bovine mastitis. Our previous work indicates that in the presence of antibiotics, autoinducer 2 quorum sensing makes the bacteria more resistant to antibiotics. This study reported that exogenous imidazole, a furan carbocyclic analogue of autoinducer 2, decreases the bacterial antibiotic resistance to ß-lactam antibiotics by inhibiting the function of autoinducer 2.


**Short communication: Calf cleanliness does not predict diarrhea upon arrival at a veal calf facility.** By Graham et al., page 3363. Diarrhea is a significant cause of sickness and death in veal calves. Early identification of diarrhea will improve outcomes. Calves were scored for cleanliness and fecal consistency upon arrival at a milk-fed veal facility. There was poor agreement between cleanliness score and fecal consistency and no correlation between the scoring methods when calves were scored for multiple consecutive days following arrival. This study demonstrates that the use of hide cleanliness is not appropriate to identify diarrhea in calves upon arrival at a veal calf facility.

https://doi.org/10.3168/jds.2017-14113.

**Short communication: Associations of feeding behavior and milk production in dairy cows.** By Johnston and DeVries, page 3367. The objective of this study was to identify associations between measures of feeding behavior and milk production using data collated from studies focused on the feeding behavior of lactating dairy cows. The results of these analyses suggest that allowing cows to improve their time spent feeding, in more frequent meals, and time spent ruminating may have a positive effect on milk yield and component production.


**Short communication: Cow- and herd-level prevalence of hypoglycemia in hyperketonemic postpartum dairy cows.** By Dubuc and Buczinski, page 3374. The objective of this study was to quantify the prevalence of hypoglycemia in hyperketonemic postpartum dairy cows. Data from 3,776 dairy cows (100 herds) were used. The prevalence of hyperketonemia, hypoglycemia, simultaneous hyperketonemia and hypoglycemia, and hypoglycemia within the subset of
hyperketonemic cows was 20.0, 13.8, 6.2, and 31.0%, respectively, whereas their herd-level median prevalence was 17.5, 15.0, 7.5, and 30.6%, respectively. These results show that approximately one-third of the hyperketonemic cows were also hypoglycemic at the time of sampling in the early postpartum period. https://doi.org/10.3168/jds.2017-13773.

**Short communication:** Methicillin-resistant *Staphylococcus aureus* in conventional and organic dairy herds in Germany. By Tenhagen et al., page 3380. Bulk tank milk samples from organic and conventional dairy herds in Germany were tested for the presence of methicillin-resistant *Staphylococcus aureus* in the framework of a national monitoring for zoonotic bacteria in the food chain. Prevalence was higher in bulk tank milk from conventional herds than from organic herds. It was also more prevalent in conventional herds than in previous investigations in Germany in 2009 and 2010. Results indicate that methicillin-resistant *Staphylococcus aureus* is increasingly prevalent in conventional dairy herds in Germany, which is of utmost importance as the bacteria are resistant to most antimicrobials licensed for use in dairy cows. https://doi.org/10.3168/jds.2017-12939.

Addition of meloxicam to the treatment of bovine clinical mastitis results in a net economic benefit to the dairy farmer. By van Soest et al., page 3387. Use of the nonsteroidal anti-inflammatory drug meloxicam in conjunction with standard antimicrobial therapy was found to improve conception rate of dairy cows with clinical mastitis. It was hypothesized that the addition of meloxicam to the treatment of clinical mastitis may result in a positive net economic benefit to the dairy farmer. Our study shows a positive net economic benefit of €42 per case of clinical mastitis per year, in favor of the meloxicam treatment. The inferences remained true over a wide range of technical and economic inputs, demonstrating that use of meloxicam in the treatment of clinical mastitis is likely to be cost effective across many production systems. https://doi.org/10.3168/jds.2017-12869.

Evaluation of an ear-tag-based accelerometer for monitoring rumination in dairy cows. By Reiter et al., page 3398. Rumination is essential in the digestive physiology of ruminants. As rumination is influenced by many physiologic and pathologic factors, an early and reliable detection of variations in rumination activity is considered to be a useful instrument for herd management decisions. In this study with indoor-housed dairy cows, the ear-tag-based accelerometer system Smartbow, which is designed for continuously monitoring rumination, showed excellent agreement between accelerometer-detected duration of rumination, chewing cycles, and rumination bouts and corresponding video analyses. Further studies should test the system under various field conditions. https://doi.org/10.3168/jds.2017-12686.

**Incorporating white clover (Trifolium repens L.) into perennial ryegrass (Lolium perenne L.) swards receiving varying levels of nitrogen fertilizer: Effects on milk and herbage production.** By Egan et al., page 3412. The objective of this experiment was to investigate the effect of including white clover in perennial ryegrass swards with 2 levels of N fertilizer application on herbage production, milk production, and herbage dry matter intake over a full lactation in an intensive grass-based spring calving system. All treatments had similar cumulative herbage production. Reducing N fertilizer resulted in an increase in sward white clover content. Cows grazing grass-clover swards had greater herbage intake and daily milk and milk solids production compared with cows grazing grass-only swards, particularly in the second half of the lactation. https://doi.org/10.3168/jds.2017-13233.

**Hot topic:** Ceramide inhibits insulin sensitivity in primary bovine adipocytes. By Rico et al., page 3428. The sphingolipid ceramide inhibits adipose tissue insulin sensitivity in obese nonruminants experiencing type 2 diabetes or fatty liver disease. The mechanism involves the ability of ceramide to inhibit the insulin-stimulated activation of protein kinase B to decrease glucose uptake. In ruminants, ceramide has emerged as an associative biomarker for impaired insulin sensitivity; however, the ability of ceramide to inhibit insulin action has not been studied. Therefore, we evaluated the relationship between ceramide supply and insulin action in differentiated primary bovine adipocytes. We observed that ceramide inhibits insulin sensitivity in primary bovine adipocytes by inactivating protein kinase B. https://doi.org/10.3168/jds.2017-13983.

**Effect of altering the type of dietary carbohydrate early postpartum on reproductive performance and milk production in pasture-grazed dairy cows.** By McDougall et al., page 3433. In previous experiments, increasing the proportion of nonstructural carbohydrates in the diet early postpartum improved fertility for cows fed total mixed rations and those in seasonal grazing systems. We assessed the effect of supplementing grazing dairy cows for 30 d postpartum with a starch-based concentrate on 3 commercial dairy farms. Increasing dietary starch resulted in herd × treatment interactions for the key reproductive outcomes, indicating differing responses across the 3 herds. Increased starch tended to increase milk yield but had no effect on body weight. https://doi.org/10.3168/jds.2016-12421.
Plasma glucose and nonesterified fatty acids response to epinephrine challenges in dairy cows during a 670-d lactation. By Marett et al., page 3501. Rebreeding was delayed for 12 Holstein-Friesian cows to extend the lactating period to up to 670 d. The plasma glucose and nonesterified fatty acids responses to 2 doses of epinephrine (low dose to measure sensitivity; high dose to measure maximal responsiveness) at each of 100, 250, 460, and 560 d in milk were measured. As milk yield declined with advancing lactation, both the sensitivity and responsiveness to epinephrine decreased. These findings support previous reports that an increasing proportion of nutrients is partitioned to body tissue gain at the expense of milk yield as lactation progresses, even up to 670 d.


Infusion of butyrate affects plasma glucose, butyrate, and β-hydroxybutyrate but not plasma insulin in lactating dairy cows. By Herrick et al., page 3524. Lactating dairy cows use short-chain fatty acids such as butyrate for energy. However, recent research with nonruminants and preruminants demonstrated characteristics of butyrate beyond that of an energy source. Furthermore, conversion of butyrate to ketone bodies by rumen epithelium and the liver complicate efforts to investigate butyrate in mature ruminants. A better understanding of butyrate metabolism in mature ruminants could assist researchers investigating opportunities for butyrate supplementation in ruminants. The current study demonstrated that butyrate infused into either the rumen or abomasum of lactating dairy cows affected several plasma metabolites and may provide benefits similar to nonruminants.


Circulating progesterone concentrations in nonlactating Holstein cows during reuse of intravaginal progesterone implants sanitized by autoclave or chemical disinfection. By Melo et al., page 3537. Nonlactating Holstein cows (n = 24) underwent treatments with 2 sources of intravaginal progesterone implants [controlled internal drug release (1.9 g of progesterone; Zoetis, São Paulo, Brazil) and Sinicrogest (1.0 g of progesterone; Ourofino, Cravinhos, Brazil)] and 3 types of processing (new, reused after autoclave, and reused after chemical disinfection). The mean plasma progesterone concentration was greater for 1.9 g of progesterone than 1.0 g of progesterone and, regardless of the type of implant, the autoclaving process provided greater circulating progesterone compared with chemical disinfection and similar or greater progesterone concentrations compared with a new implant.


Effect of dietary vitamin D3 and 25-hydroxyvitamin D3 supplementation on plasma and milk 25-hydroxyvitamin D3 concentration in dairy cows. By Guo et al., page 3545. Information on the feasibility to enrich milk with vitamin D by supplementing dairy cow diets is limited. The main objective of the current study was to investigate the effect of supplemental vitamin D3 or 25(OH)D3 in dairy cow diets on plasma and milk vitamin D concentration. Results suggested that supplementation with 25(OH)D3 was more effective in increasing plasma 25(OH)D3 compared with vitamin D3. However, we did not detect a significant increase of vitamin D concentrations in the milk.


Follicular dynamics, circulating progesterone, and fertility in Holstein cows synchronized with reused intravaginal progesterone implants that were sanitized by autoclave or chemical disinfection. By Melo et al., page 3554. Fixed-time artificial insemination (AI) programs have been widely used worldwide and represent an important reproductive management tool for improving reproductive efficiency and profitability of commercial dairy herds. To reduce costs in a progesterone-based protocol, the reuse of the intravaginal progesterone devices is of interest, mainly if they were previously autoclaved, leading to an adequate endocrine environment during preovulatory follicle growth and better fertility. Although the autoclaving process provided a different profile of circulating progesterone during a fixed-time AI protocol, the follicular dynamics, synchronization rate, and pregnancy per AI were not affected, and the ciclicity status or ovulation at the beginning of the protocol influenced several reproductive variables.


The unfolded protein response is involved in both differentiation and apoptosis of bovine mammary epithelial cells. By Yonekura et al., page 3568. The present study examined the role of unfolded protein response on the mammary development of dairy cows. We found that activating transcription factor 4 is involved in the cell differentiation mechanism via the control of the expression of lactogenic hormone receptors in bovine mammary epithelial cells. We also observed a strong negative correlation between the expression level of C/EBP homologous protein, which is an apoptosis-related protein induced by endoplasmic reticulum stress, immediately after delivery and the initial milk yield. These results indicate that unfolded protein response is intrinsically associated with the apoptosis of mammary gland epithelial cells, which affects the differentiation of these cells as well as the milk yield.

https://doi.org/10.3168/jds.2017-13718.
**Short communication:** Test of the relationship between prepartum milk leakage and blood calcium concentration in Holstein cows—An observational study. By Mahjoubi et al., page 3579. Milk leakage has been considered as one cause of mastitis in dairy cows. Because Ca is needed for the proper function of the teat end sphincter, it is hypothesized that prepartum milk leakage is dependent on blood Ca status. It was found that neither prepartum plasma Ca and P concentrations nor teat length were related to prepartum milk leakage. Prepartum milk leakage was not related to postpartum metabolic disorders, but those cows with milk leakage produced more milk throughout 4 mo in lactation. https://doi.org/10.3168/jds.2017-13767.

**Symposium review:** Interaction of starter cultures and nonstarter lactic acid bacteria in the cheese environment. By Blaya et al., page 3611. Starter cultures are used to ensure the initial acidification of milk; however, nonstarter lactic acid bacteria may contribute to defects or inconsistency in cheese quality as well as to the development of typical cheese flavor depending on the species and strain-dependent metabolic activity. Molecular methods are being used to gain new perspectives on the activity of microbes in cheese. Microbial community modeling can contribute to improving the efficiency and reduce the cost of food processes such as cheese ripening. https://doi.org/10.3168/jds.2017-13345.

**Symposium review:** Lipids as regulators of conceptus development: Implications for metabolic regulation in dairy cattle. By Ribeiro, page 3630. Lipid metabolism is critical for conceptus elongation, which is a prerequisite for maternal recognition, implantation, and survival of pregnancy. The nuclear receptor peroxisome proliferator-activated receptor gamma works as a sensor of cellular lipids and coordinates lipid metabolism in trophectoderm cells during elongation. Factors altering concentration or composition of lipids in the histotroph could potentially impair conceptus development by altering peroxisome proliferator-activated receptor gamma activity. Inflammatory diseases and excessive loss of body reserves can have lasting effects on lipid metabolism and are important predisposing factors for pregnancy losses. Altered lipid homeostasis in cows with these conditions might help explain reproductive failures attributable to impaired uterine environment. https://doi.org/10.3168/jds.2017-13335.

**Symposium review:** Building a better cow—The Australian experience and future perspectives. By Pryce et al., page 3702. Genomic selection is ideally suited to difficult-to-measure traits that can be used to build a better cow. In Australia, it has been applied to 2 novel traits: feed efficiency, which was released to the dairy industry in 2015 as feed saved breeding values, and heat tolerance genomic breeding values, released for the first time in 2017. Feed saved is already included in the national breeding objective, which is focused on profitability and designed to be in line with farmer preferences. Our future focus is on traits associated with animal health, either directly or in combination with predictor traits. https://doi.org/10.3168/jds.2017-13377.