

Below you'll find short summaries highlighting publications impacting ruminant and other species nutrition in the US. Please feel free to reach out with any questions or if seeking specific follow-up information.

Cecal acidosis: an emergent digestive disorder in ruminants (Ribeiro et al. 2026): This review brings attention to cecal acidosis, an underrecognized digestive disorder in ruminants. While the rumen remains the primary site of fermentation, the cecum contributes to SCFA production from starch and fiber that escape ruminal and small-intestinal digestion. Because the cecal epithelium has a much smaller absorptive surface area and limited buffering capacity, it's more susceptible to drops in pH when fermentation rates increase. Excessive hindgut fermentation can reduce cecal pH, damage epithelial integrity, increase intestinal permeability, and promote translocation of endotoxins (LPS) into circulation, often without obvious clinical signs. Cecal acidosis may occur at milder disturbances than ruminal acidosis and can negatively affect intake, gut health, and nutrient utilization. The authors note that the most effective way to reduce cecal acidosis risk is to improve ruminal fermentation and starch capture to limit the amount of fermentable substrate reaching the hindgut. That said, nutritional strategies that help maintain a more stable rumen environment may play an indirect, but important role in supporting downstream gut health by reducing acid load and inflammatory pressure in the cecum.

Prepartal liver glutathione and its association with lactation performance, metabolism, and health outcomes in transition dairy cows (Lima et al. 2025): This study examined how a cow's pre-calving liver glutathione (GSH) status influences metabolic adaptation and early-lactation performance. Holstein cows (n=60) were grouped into quartiles based on liver GSH measured about 8 days before calving. Cows with higher prepartal GSH showed better pre-calving energy balance, slightly higher DMI, improved postpartum BCS, and produced more milk and ECM through 30 DIM. These cows also had more favorable metabolic profiles and lower markers of stress. Liver gene expression patterns suggested that cows with greater GSH had upregulated pathways for glutathione synthesis and recycling. Collectively, the work highlights the importance of adequate hepatic antioxidant reserves before calving as a foundation for smoother metabolic transition, reduced ketosis risk, and improved early lactation performance. These findings reinforce the broader value of nutritional strategies that enhance antioxidant capacity ahead of calving, including the use of polyphenol-based technologies (like Elife) that support redox balance.

Omega-3 supplement alters water consumption and plasma fatty acid profile of beef heifers (Green et al. 2025): This study evaluated a flaxseed-oil low-moisture block as an omega-3 supplementation strategy for beef heifers and found several notable physiological shifts. Compared with heifers receiving a standard loose mineral, those supplemented with the flaxseed-oil block showed altered feeding behavior, reduced water intake, and clear changes in circulating lipid profiles, including higher α -linolenic acid, linoleic acid, and total PUFA concentrations by week 8. These fatty acid shifts aligned with a tendency for earlier puberty attainment and lower progesterone at insemination, indicators that may support improved endocrine readiness for breeding. While conception rates did not differ between treatments, the study demonstrates that n-3 supplementation via a self-fed block can meaningfully modify metabolic and reproductive parameters in growing beef heifers, with potential implications for optimizing development programs.

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Green tea extract complex as a phytogetic supplement to reduce bile salt hydrolase activity and enhance growth performance in weaning pigs (Cho et al. 2025): This study evaluated a phytogetic feed additive (GBK) with green tea extract, butyric acid, and vitamin K for improving growth and gut health in weaning pigs. In a 4-week trial with 192 crossbred piglets, researchers compared 6 diets: a basal control, antibiotic (colistin), ZnO, and 3 GBK inclusion levels (0.05%, 0.10%, and 0.20%). GBK supplementation linearly improved ADG and feed efficiency, with the 0.10% and 0.20% levels performing comparably to the antibiotic and ZnO treatments. Fecal consistency improved and diarrhea was eliminated in GBK pigs, with no adverse effects on blood parameters. Pigs receiving GBK also showed reduced concentrations of pro-inflammatory cytokines and oxidative stress markers, along with higher levels of mucosal IgGs, indicating enhanced intestinal immunity and reduced inflammation. GBK supplementation altered the gut microbiome, increasing beneficial genera and reducing bile salt hydrolase-producing bacteria.

Persistence of subacute ruminal acidosis across first and second lactations in dairy cows based on reticular pH metrics and microbiota, and systemic health responses (Biber et al., 2025): This study explored whether the severity of SARA observed in first-lactation dairy cows persists into the second lactation. Holsteins (n=17) were grouped as LOW or HIGH SARA severity based on reticular pH metrics from their first lactation and fed a moderate- then high-concentrate diet in their second lactation. The researchers found that reticular pH metrics and systemic health markers did not persist across lactations, indicating cows may improve their ability to adapt to high concentrate feeding with age. However, cows retained distinct fermentation and microbial differences: HIGH cows produced more acetate and butyrate and less propionate, had lower ruminal but higher fecal VFA concentrations, and showed signs of fermentation shifting into the hindgut. Whereas LOW cows maintained more efficient ruminal fermentation with a stronger propionate shift. Microbiome analysis revealed that high concentrate feeding reduced overall alpha diversity, but HIGH cows consistently had greater microbial diversity. Overall, while SARA severity defined by pH does not carry over between lactations, underlying microbial and fermentation signatures remain, which may influence how cows handle dietary challenge.

Evaluating the effects of feeding management practices and ruminal acidosis on the development of liver abscesses in beef x dairy crossbred steers (Loeffler et al., 2025): One generalized understanding of the onset of liver abscesses in beef on dairy steers is that ruminal damage leads to microbial infiltration of the bloodstream, ultimately infecting the liver and causing abscesses. The authors aimed to challenge this understanding by inducing acidosis and/or dosing microbes known to cause abscesses into crossbred feedlot steers. The number of animals per treatment is small (~10), but after 5 weeks of induction, ultrasound measurement of liver abscesses as a predictive tool had 97% accuracy. Acidosis induced a rise in white blood cells and neutrophils whereas dosing of *Salmonella enterica* decreased platelet counts, at 10d post-inoculation. It's unfortunate the statistical power was low in this study, because acidosis increased liver abscesses (from 0 to 22%) whereas non-acidosis treatments with doses of *Fusobacterium necrophorum* increased more severe abscesses. It is likely the acidosis induction was not that severe, with only 11% of cattle having rumen wall damage. *Fusobacterium spp.* Was mostly cultured from infected livers whereas *Salmonella* was recovered from healthy livers. More work

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needs to be done in this area, but this study adds to our understanding that the liver abscesses are a multifaceted problem that require an integrated solution.

Effects of maternal curcumin nano-micelle supplementation on ewes and their offspring: Impact on Nutrient Digestibility, Ruminal Fermentation Parameters, Milk Composition and Metabolic Health During the Transition Period (Bokharaeian et al., 2025): This study investigated the effects of curcumin (a bioactive from turmeric) nano-micelle (CNM) supplementation on ewes and their offspring during the transition period. Pregnant crossbred ewes (n=32) received either a control diet or 40 mg CNM/day from day 125 of gestation to day 21 postpartum. CNM supplementation improved DMI and body weight in ewes and their lambs. Ewes receiving CNM produced more milk with reduced SCCs, suggesting improved udder health. Colostrum from treated ewes contained 13% higher IgG, which may enhance passive immune transfer to lambs. Lambs had lower serum cholesterol and triglycerides and higher thyroid hormone concentrations. CNM also enhanced rumen fermentation and improved insulin sensitivity in ewes during the early postpartum period. The authors attributed observed improvements to the antioxidant, anti-inflammatory, and immunomodulatory properties of the polyphenolic curcumin.

Microbial communities and tight junction protein expression in the gastrointestinal tract of feedlot cattle (Young et al. 2025): This study established baseline data on gut microbiome structure and tight junction protein (TJP) expression in finish-fed feedlot steers, revealing that GIT region, not the individual animal, was the primary driver of variation. Distinct microbial communities were observed in the rumen, small intestine, large intestine, and feces, with nine core bacterial families dominated by SCFA-associated groups consistently present across sites. TJPs also showed clear region-specific patterns: the small and large intestines had substantially greater expression of barrier-related proteins than the rumen, while occludin was uniformly expressed across tissues. Although only three steers had liver abscesses, their abscess microbiota were unique, with lower diversity and a separate microbial profile compared to the GIT, suggesting a more selective microbial population. This reinforces the idea that liver abscesses are associated with specific microbial shifts rather than the overall gut community.

Periparturient oxidative and inflammatory status and their relation to energy metabolism and performance in transition dairy cows (Zhang et al. 2025): This study evaluated how oxidative stress, inflammation, and energy metabolism interact during the transition period by tracking oxidative and inflammatory biomarkers in 66 lactations from 57 multiparous Holsteins. Cows were grouped by antioxidant capacity and acute phase response at 21 DIM. Those with lower antioxidant ability showed higher BHBA, greater metabolic stress, reduced milk yield between d 5-21, and a higher incidence of early-lactation health issues. In contrast, cows with stronger antioxidant status or without an acute phase response maintained better metabolic adaptation and overall performance. Although oxidative and inflammatory patterns only modestly overlapped, the study highlights the biological variation among clinically normal cows and reinforces that impaired antioxidant capacity may predispose animals to transition problems.

Associations between periparturient calcium dynamics of multiparous Holstein cows and inflammation markers during the transition period (Graef et al. 2025): This study examined how different patterns of subclinical hypocalcemia (SCH) around calving relate to inflammation, intake, and milk production in multiparous Holstein cows. Cows with persistent SCH (low blood

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calcium at both 1 and 5 DIM) showed higher postpartum inflammatory markers compared with normocalcemic and transient SCH cows, indicating a more pronounced and prolonged inflammatory response. These persistently hypocalcemic cows also had lower DMI in early lactation and the lowest milk yield and ECM over the first 9 weeks of lactation. In contrast, cows with transient SCH recovered calcium status quickly, exhibited lower inflammatory markers postpartum, and achieved the highest milk and ECM yields. The study highlights that not all SCH is equal; persistent disruptions in calcium homeostasis are linked with greater inflammation and poorer early-lactation performance. This serves as a good reminder of the importance of managing calcium dynamics during transition.

Live Presentations:

- At Georgia Dairy Conference, Dr. **Brandon Treichler** emphasized that smarter udder health management starts with refusing to tolerate poor results, especially during the high-risk transition and fresh periods when oxidative stress and immune suppression peak. He stressed that mastitis is fundamentally linked to oxidative stress driven by events like ration changes, pen moves, heat or cold stress, overcrowding, and freshening itself, which helps explain why disease pressure is lowest in late lactation and highest during physiological transitions. He noted that while chronic cows and quarters will always exist, the most impactful strategy is preventing new infections by consistently executing the basics and supporting immune function. In this context, nutritional strategies that enhance antioxidant protection via vitamin E, selenium, and other immune-supportive antioxidants were highlighted as tools that can move the needle on mastitis prevention, reinforcing the importance of proactively supporting redox balance rather than relying on treatments after damage has already occurred.
- Dr. **Kelly Nichols'** presentations at both Southwest Nutrition Conference and the Florida Ruminant Nutrition Symposium reinforced that improving protein efficiency in dairy systems is becoming an economic and environmental imperative. Only about 30% of dietary protein is ultimately captured in milk protein, with the remainder largely lost through fecal and urinary nitrogen. Today, nutritionists are being challenged to maintain milk protein yield while reducing dietary crude protein (CP) and nitrogen excretion. A central theme of the talk was that protein efficiency is not fixed, but rather a function of how rumen nitrogen supply, energy availability, and post-absorptive metabolism are managed together. Rumen-available nitrogen is highly inefficient; ~79% of surplus rumen N is excreted in urine, offering no production benefits. Research presented showed that supplementing additional rumen degradable protein to meet estimated rumen N requirements increased milk urea nitrogen and predicted urinary N excretion, without improving milk yield or milk protein output. These findings suggest opportunities to improve N efficiency by moderating ruminal protein breakdown instead of adding more protein. She also noted that lactating cows exhibit metabolic flexibility, including the ability to rely on endogenous urea recycling to buffer short-term ruminal nitrogen deficits. These data point back to oscillating CP in TMRs studied by Dr. Weiss and students at OSU in Wooster, where cows were fairly resilient to simulated mixer wagon errors in protein inclusion. Strategies that stabilize rumen fermentation and reduce excessive ammonia formation may allow for lower protein diets without compromising performance. Together, these findings point toward a modern protein strategy focused on controlling rumen protein degradation, improving the efficiency of nitrogen capture, and enhancing the

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conversion of feed protein into milk protein, rather than relying solely on higher CP levels or expensive protected protein sources.

- At the [Florida Ruminant Nutrition Symposium](#), **Dr. Stephanie Hansen** spoke on several factors related to vitamin supplementation of beef cattle. Timing of vitamin A supplementation, for example, heavily impacts its effect on marbling because early A supplementation in calves can increase marbling (or even in late gestation) whereas later supplementation may have no influence or a possibly negative influence. As vitamin A is pulled from the diet in finisher cattle, increased Zn (especially in receiving diets) can help recycle vitamin A to prevent deficiency. Vitamin D also received brief notes, particularly around unpublished future data supporting activated D fed before trucking or implantation promoting greater myogenic expression and improved carcass yields. These last notes are particularly interesting because there is limited support for high D or high synthetic, pre-D diets in beef cattle but there appear to be some positive data upcoming.
- In his talk at High Plains Dairy Conference, **Dr. Greg Penner** focused on nutritional mitigation of heat stress induced leaky gut in lactating dairy cows, specifically evaluating the roles of DCAD and dietary buffer. Heat stress reduces milk yield through decreased DMI, compromised rumen function, and increased intestinal permeability that often leads to systemic inflammation. In a 4 × 4 Latin square design using 16 lactating Holsteins exposed to mild heat stress, researchers compared low vs. high DCAD (10 vs. 30 mEq/100 g DM) and low vs. high dietary buffer (CaMg(CO₃)₂). Increasing DCAD improved systemic acid-base status, increased urine output and sodium excretion, and increased milk fat yield. However, neither DCAD or this particular buffer affected DMI, milk yield, ruminal pH, ruminal SCFA concentrations, or feeding behavior under these mild heat stress conditions. The buffer reduced post-ruminal intestinal permeability by ~27% though, suggesting a protective effect on gut barrier function during heat stress. Most marker excretion occurred post-ruminally, reinforcing that heat-stress induced leaky gut primarily affects the intestinal regions rather than the rumen. In contrast, increasing DCAD did not reduce permeability. He concluded that while higher DCAD can support systemic electrolyte balance and milk fat production, buffering with CaMg(CO₃)₂ may play a more direct role in stabilizing intestinal barrier function during mild heat stress conditions.

Other notes:

1. Now that we're officially closer to 2050 than we are to 2000, JDS Communications released a [special issue on the future of dairy](#). Together, three of the invited pieces paint a nice picture of where the industry is headed, from the cow, to her care, to the milk she produces. [One review](#) predicts that the dairy cow of the future will be shaped by advances in genomics, phenomics, and precision technologies. Breeding goals will shift beyond milk yield toward improved health, fertility, resilience, and feed efficiency. Complementing this, a [second review](#) highlights growing evidence that dairy cattle possess complex cognitive abilities (e.g., learning, memory, social recognition, behavioral flexibility) that must be considered in the advancement of management, housing design, human-animal interactions, and welfare frameworks. Moreover, [DMI's Eve Pollet](#) looks beyond the farm to the consumer, arguing that by 2050 milk may evolve into a higher-value, personalized food enabled by digital technologies, biomarker-driven nutrition, and AI-powered health insights; the dairy industry must support this evolution through genetics, production, processing, marketing, and commercialization.

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2. In a [study of over 9,000 Beef x Dairy cattle](#) from the U.S. Meat Animal Research Center, estimated genomic heritability of liver abscesses was extremely low, indicating that **genetics contribute minimally to beef liver abscess incidence**. Genetic selection would be a slow and inefficient strategy for reducing prevalence. Instead, management and dietary interventions will have a much greater and faster impact.
3. A [recent study out of Australia](#) found that Agolin provided an economic gain of +\$0.91/head/day in their herd of 60 multiparous Holstein-Freisians. While no statistically significant methane mitigation was observed, the authors noted that these results differed from much of the existing Agolin literature. They suggested that factors such as feeding frequency (twice-daily pulse feeding vs. continuous intake in TMR systems) and the method of methane measurement (modified SF₆ tracer technique) may have influenced the observed response. Despite this, small numerical increases in milk components and slightly lower intakes resulted in a favorable income over feed cost, making Agolin the most profitable treatment in their study.
4. [New research shows](#) that innate immunity markers (e.g., calprotectin, myeloperoxidase, ADA) were higher in saliva than serum, positioning saliva as a promising non-invasive tool for monitoring early calf health and inflammation.
5. In heat-stressed dairy cows (THI ≥ 75), [hair cortisol concentration was higher in black-coated cows](#) and lowest in white-coated cows, with brown, red, and yellow coats falling in between. When using hair cortisol as a biomarker of chronic stress and heat load, coat pigmentation should be considered.
6. Supplementing [finishing steers with 400 mg/kg of resveratrol](#) (a plant-derived polyphenol) improved growth performance and carcass weight while increasing intramuscular fat and beef tenderness. These benefits were linked to activation of the PPAR γ signaling pathway, which upregulated fatty acid uptake and lipid synthesis in muscle.
7. A [review](#) of mycotoxins in the rumen from last fall serves as a good reminder that cows aren't fully protected from mycotoxins by rumen metabolism. Chronic exposure and co-occurrence of toxins can impair immunity, reproduction, and milk production even when individual toxins are below regulatory limits. The authors suggest that cattle with higher production stress (e.g., dairy vs. beef) and cattle with higher DMI driving faster rumen turnover rates are most susceptible. Moreover, emerging compounds like enniatins and beauvericin are increasingly detected in silage and milk, are resistant to pasteurization, and show immunomodulatory and cytotoxic effects, highlighting the growing gap between monitoring and risk.
8. [Early life *Cryptosporidium parvum* infection](#) (≤ 8 days of age) had the greatest negative impact on calf health and performance, increasing the risk of diarrhea nearly fourfold, prolonging diarrheal episodes, and making calves almost 8x more likely to gain < 500 g/day. [Difficult calving and inadequate passive transfer significantly increased early infection risk](#), highlighting the importance of calving management, colostrum success, and early-life hygiene to protect calf growth potential.
9. Bovine digital dermatitis (BDD) is a major economic concern to the North American dairy industries in terms of lameness, lost milk production, and treatment or culling decisions. However, as much as we know about the root cause (including bacterial members of genus *Treponema*, influenced by mineral supplement source), research progress is limited by the lack of reliable disease induction models. The [current study](#) in Canada attempted to instigate BDD with tattooed penetration contaminated with *Treponema* spp. (known

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bacterial cause) into wet feet in calves. Although the authors could recover cultures of *Treponema* in the calves' feet, the BDD lesions did not occur. The authors conclude that there are still additional risk factors needed to drive BDD lesions in cattle.

10. In a [transition cow study](#) led by Dr. Tanya France, the group found that cows receiving omega-3 enriched calcium salts had greater postpartum DMI compared with cows not fed supplemental omega-3s, supporting improved nutrient intake during early lactation. Omega-3 supplementation was also associated with higher ECM yields. As expected, feeding EPA and DHA increased the concentration and yield of long-chain omega-3 fatty acids in milk, while reducing the milk n-6:n-3 FA ratio.
11. Among small ruminants, the NRC recognizes that reindeer (caribou) are the only species that matches the requirement of high producing dairy cows for calcium, phosphorus, and magnesium. However, the difference is that female reindeer deposit calcium for rapid antler growth before calving. A [recent study](#) observed female reindeer after their migration to annual calving grounds and hypothesized that this heavy investment in Ca deposition by female reindeer provides a bank of minerals (Ca, P, Mg) that their body can draw from during early lactation so they don't need to rely as much on finding feed right after giving birth.
12. Researchers isolated cows from a previous study that high ruminations times vs. low ruminations (90 minutes different) and pulled rumen microbial samples from both. There were [differences in methane production](#) (high rumination times made 20% less methane) and microbial populations that the author attributed to rumination times, less CO₂ available to methanogens, and improved rumen efficiency. While this is plausible, rumination times may also impact gas release, and in a GreenFeed system may have skewed the methane estimation based on when the gas escaped.
13. In a novel probiotic [study at University of Wisconsin](#), cows fed the product improved feed efficiency by 0.2, which raises questions if there's a price for this product that fits within the predicted return. No *significant* ECM effects were observed in the current study.
14. Researchers in Asia compared [high growth vs. low growth sheep](#), looking at genetic factors for variation that could lead to selection strategies. A specific KLF15 gene was found in high growth sheep, with a corresponding spike in rumen bacteria within Rikenellaceae RC9 Gut Group. This combination points to continued evidence of host genomic interactions with the rumen microbiome and adds to support that the RC9 Gut Group is involved in more efficient ruminants.

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