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.

A multi-mineral intervention is associated with improved intestinal permeability in patients with ulcerative colitis: results from a pilot trial (Aslam et al. 2026): This clinical trial from the University of Michigan evaluated the effects of 90 days of Aquamin supplementation (the human form of Calmin, containing 800 mg total Ca/day) in patients with mild ulcerative colitis (UC) or UC in remission. At baseline, UC patients exhibited greater intestinal permeability than the healthy controls, measured by urinary mannitol excretion as a marker. After supplementation researchers found that Aquamin reduced total intestinal permeability by 29%, suggesting improved gut barrier integrity. The supplement was well tolerated with no serious adverse events, and researchers also observed a modest reduction in serum alkaline phosphatase. These findings build on previous work demonstrating that Aquamin upregulates proteins involved in tight junctions, cell adhesion, and the mucosal barrier, providing the first in vivo evidence that this product can improve intestinal barrier function. While conducted in humans with UC, this work further supports the biological role of calcified marine algae minerals in maintaining epithelial integrity, which may have broader implications for gut health and inflammation across species. Stay tuned for upcoming research data in dairy cattle.

Fish oil-derived eicosapentaenoic and docosahexaenoic acids enhances synthesis of pro-resolving oxylipins and improves growth performance and insulin sensitivity in feedlot cattle (Pittaluga et al., 2026): This study from The Ohio State University evaluated the effects of supplementing feedlot steers with encapsulated fish oil rich in EPA and DHA, two omega-3 fatty acids known for their anti-inflammatory and pro-resolving properties. Steers fed the encapsulated fish oil had greater ADG and were consistently heavier throughout the finishing period compared to cattle fed tallow. Omega-3 supplementation shifted the plasma oxylipin profile toward a more "pro-resolving" state by increasing omega-3-derived lipid mediators associated with inflammation resolution and insulin sensitivity while reducing several pro-inflammatory oxylipins. Steers receiving fish oil also exhibited improved insulin sensitivity near the end of the trial, suggesting potential metabolic benefits beyond growth performance. As such, the data suggest that rumen-protected EPA and DHA may help improve feedlot efficiency and energy metabolism through modulation of inflammatory signaling and metabolic function.

Heat stress increases enteric methane emissions yield and intensity while impairing rumen function and productivity in lactating dairy cattle (Onan-Martinez et al., 2026): This recent University of Florida study evaluated how heat stress impacts rumen function and productivity in mid-lactation dairy cows by comparing cows housed with shades, fans, and soakers exposed to heat stress conditions during the summer. Heat-stressed cows experienced declines in DMI (-11.7 lbs/d), rumination time, rumen motility, and milk production, while rumen temperature rose and rumen pH tended to drop around feeding. These changes suggest that heat stress disrupts normal rumen function by reducing salivary buffering, altering fermentation patterns, and slowing rumen dynamics. As a result, milk yield and ECM decreased, with reductions in milk protein and component yields. Negative effects persisted even after cows were returned to cool conditions, indicating long-term effects of heat stress on performance and rumen health.

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Influence of endophyte-infected tall fescue seed consumed by pregnant heifers on uterine artery blood flow and offspring growth performance: investigating melatonin as a potential therapeutic (Scott-Cogle et al., 2026): This study looked at how consumption of endophyte-infected fescue during mid-to-late gestation impacts pregnant beef heifers and offspring performance. They found that heifers consuming toxic fescue had lower plasma prolactin, decreased uterine artery blood flow, and smaller uterine artery diameter, impairing nutrient and oxygen delivery to the developing fetus. These changes led to shorter gestation and lighter calves at birth, weaning, and post-weaning. Supplementing melatonin did not fully restore uterine blood flow, but it recovered over 60% of the fescue-associated losses in calf growth performance through weaning and post-weaning development. As such, dietary melatonin may be a practical strategy to partially mitigate performance losses in affected cattle.

Response of blood biochemical metabolites, ruminal fermentation, and bacterial genetic diversity to chitosan supplementation in goats (El-Zaiat et al. 2026): Researchers evaluated the effects of adding chitosan to the goat diets for 42 days, examining blood metabolites, rumen fermentation characteristics, and rumen microbial populations. Chitosan supplementation increased serum total protein and albumin while reducing blood urea N, indicating improved protein metabolism. In the rumen, chitosan shifted fermentation toward greater propionate production and a lower acetate:propionate ratio while reducing ammonia N, acetate, and butyrate, demonstrating improvements in energetic efficiency. Microbial analysis showed that chitosan altered the rumen bacterial community and increased microbial richness, including a greater abundance of taxa linked to feed efficiency. These findings position chitosan as a way to support better feed utilization by influencing rumen fermentation and microbial populations.

Short-term impact of betaine supplementation on ruminal microbial relative abundance, nutrient digestibility, serum metabolites, and milk composition in heat-stressed dairy cows (Abdelmegeid et al. 2026): This study evaluated the short-term effects of supplementing 80 g/day of natural betaine in heat-stressed Holstein cows over a 4-week period. Betaine supplementation significantly improved DMI (46.3 vs. 41.2 lbs/d) and milk yield (78.0 vs. 68.8 lbs/d), and also increased milk fat and protein content compared to the control. Physiologically, betaine helped mitigate heat stress, evidenced by lower rectal temperatures and respiration rates. Feeding betaine also reduced systemic inflammation, with lower concentrations of haptoglobin and serum amyloid A. In the rumen, betaine increased total VFA concentrations and promoted beneficial microbial populations involved in fiber digestion and rumen stability. It's worth noting that the 80 g/day inclusion used here is substantially higher than typical commercial feeding rates and likely reflects the researchers' aggressive heat stress challenge model designed to maximize any measurable responses.

Ascophyllum nodosum extract modulates stem cell and immune cell surveillance in an acute placebo-controlled cross-over trial: Implications for healthy aging (Grinage et al. 2026): Researchers evaluated the acute effects of a polyphenol-rich extract from the brown seaweed *Ascophyllum nodosum* on immune and regenerative biomarkers in healthy adults. Participants consumed either 50 mg, 300 mg, or a placebo, with blood samples collected up to 2 hours after ingestion. They found that even a single serving rapidly influenced immune signaling, increasing cytokines like IFN-γ and IL-6 while also elevating the anti-inflammatory mediator IL-1 receptor antagonist. The extract also promoted immune cell surveillance alongside changes in circulating

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stem cell populations that suggest more tissue repair. The lower dose produced the most balanced immunomodulatory response. These findings indicate that bioactive compounds from *A. nodosum*, largely fucoidan, laminarin, and polyphenols, may rapidly activate coordinated immune and regenerative pathways to support immune resilience and healthy aging.

Thymol modulates rumen barrier function and inflammation in feed-restricted lambs (Ahmadibonakdar et al., 2026): Researchers evaluated whether thymol, a phenolic compound with antioxidant and anti-inflammatory properties, could help protect rumen barrier integrity during periods of severe feed restriction in lambs. Lambs were assigned to a control diet, severe feed restriction (25% of ad lib intake), or severe feed restriction with thymol (n = 10/trt). Feed restriction reduced growth performance and negatively impacted rumen morphology and barrier-associated gene expression. However, thymol supplementation improved several markers of rumen health, including increased expression of tight junction proteins, while also reducing expression of the pro-inflammatory cytokine IL-6. Thymol-fed lambs also showed lower plasma haptoglobin concentrations during refeeding, indicating less systemic inflammation. Additionally, thymol tended to maintain VFA concentrations closer to control levels and improved histological characteristics of the rumen epithelium. Overall, the authors concluded that thymol may help preserve rumen epithelial integrity and modulate inflammatory responses during periods of stress.

Physiological changes during the evolution of diarrhea in preweaning calves prior to the onset of clinical signs (Bierlein & Gross, 2026): This study evaluated metabolic and digestive changes in neonatal calves in the days leading up to diarrhea. Calves were monitored daily during the first 2 weeks of life, and they saw the calves that later had diarrhea showed physiological changes up to 3 days before clinical signs appeared. These calves had lower circulating concentrations of IgG, triglycerides, insulin, cholesterol, and plasma osmolality, indicating early metabolic stress and impaired nutrient utilization. After diarrhea onset, fecal pH increased while VFAs declined and fecal triglycerides rose, which points to disrupted digestion and gut fermentation. Milk intake was similar between groups before symptoms developed, suggesting that metabolic alterations preceded reduced feed intake. These results highlight that subclinical metabolic and digestive changes occur before visible diarrhea, meaning there may be opportunities for earlier detection and intervention through hydration and management strategies.

Comparison of the impact of yeast products, herbs, and dried chokeberry on growth performance, antioxidant and immune status, feeding activity, and residual effects in young fattening bulls (Bendowski et al. 2026): Researchers evaluated the effects of several natural feed additives on growth performance, antioxidant status, immunity, and feeding behavior in young fattening bulls. 96 Limousin bulls were assigned to 8 dietary treatments for 80 days, followed by an 80-day period without supplementation to assess residual effects. Bulls supplemented with herbal blends containing thyme, garlic, marshmallow, and lovage, as well as dried chokeberry pomace rich in polyphenols and tannins, showed improvements in total antioxidant capacity, immunoglobulin concentrations, and overall growth performance compared with unsupplemented controls. Interestingly, some benefits persisted even 80 days after the additives were removed from the diet, suggesting potential residual effects on rumen function, immune status, and oxidative balance. The authors noted that polyphenol- and phytogenic-based

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additives may help modulate rumen fermentation, improve nitrogen utilization, and reduce oxidative stress during adaptation periods in feedlot cattle.

Early rumen development in calves: Biological processes and nutritional strategies — A mini-review (Ghaffari et al., 2025): This mini-review summarizes the biological and nutritional drivers of early rumen development in dairy calves, demonstrating how the transition from milk to solid feed programs long-term rumen function. Rumen maturation is governed by coordinated transcriptional reprogramming, microbial colonization, and structural changes, with butyrate as a signaling molecule that stimulates epithelial cell proliferation and papillae growth. Starter diets rich in fermentable starch speed up rumen development by promoting butyrate production, but excessive starch can increase the risk of acidosis, stressing the need for careful grain processing and particle size management. Inclusion of forage supports rumen pH stability, chewing activity, and wellbeing, but high forage levels can limit energy intake and papillae development due to gut fill and a shift toward acetate production. The authors conclude that balanced early-life nutrition that integrates appropriate starch sources, processing methods, and controlled forage inclusion is critical to optimize rumen development and future productivity in calves.

Resveratrol ameliorates early-weaning stressed calves via alterations in gut microbiome and metabolome (Ma et al. 2025): This study evaluated the effects of supplementing the polyphenol resveratrol in early-weaned dairy calves, a period often associated with oxidative stress, inflammation, and digestive disorders. In this study, calves weaned early (49 d) received 2 g/day of resveratrol from d 7-49, which improved ADG, feed efficiency, and final BW, while reducing diarrhea incidence compared with early-weaned controls. The benefits were linked to reduced oxidative stress and inflammatory markers, along with increased antioxidant activity. Resveratrol also reshaped the gut microbiome, increasing beneficial bacteria and boosting production of VFAs and tryptophan-derived metabolites, which are both associated with improved intestinal health and immune regulation.

Live Presentations:

- Our much-anticipated feedlot data was presented by Colorado State PhD student **Sydney Bowman-Schnug** at Plains Nutrition Conference in April. She ran a feedlot study comparing a traditional 28-day feedlot adaptation to a faster 14-day program, with or without Calmin. The group wanted to see if speeding up adaptation hurt performance, and if Calmin could help offset any negatives. The slower, conventional approach led to slightly better early growth and feed efficiency, showing that rushing cattle onto high-energy diets did come with tradeoffs. Adding Calmin to the accelerated program did not improve gain or carcass performance compared to the fast program alone, but Calmin supplementation did show a reduction in severe liver abscesses (~4% vs ~19%). Calmin likely helped support rumen function and gut integrity when the cattle were pushed harder nutritionally, reducing the opportunity for bacteria to enter the bloodstream and contribute to liver abscess formation. More data to come at ASAS in July.
- Dr. **Chuck Nicholson**'s presentation at Herd Health and Nutrition Conference highlighted how dairy profitability is increasingly driven by milk components rather than milk volume alone. Over the past decade, both production and demand for butterfat have risen, contributing to higher component values, but lately, increases in supply have begun to pressure prices. At the same time, changes to Federal Milk Marketing Order pricing

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formulas may reduce calculated component values while shifting overall milk price dynamics. An emerging challenge is balancing fat and protein, as excess butterfat relative to protein can negatively impact cheese manufacturing efficiency. From a nutritional and management standpoint, the takeaway is that more components are not always better; profitability depends on producing the right components for the market. Evaluating feeding strategies through income over feed cost is the most effective way to optimize economic returns, especially as component values continue to fluctuate.

- Dr. **Eduardo Rico**'s presentation at Tri-State Dairy Nutrition Conference dove into the topic of how we can help manage uncontrolled inflammation through the diet. Evidence suggests that metabolic disorders like ketosis are closely tied to immune activation, with many cows experiencing endotoxemia and oxidative stress, indicating that reduced intake and performance may be driven as much by immune demand as by energy deficiency. This reinforces the concept that the activated immune system competes for nutrients, creating non-productive requirements that must be nutritionally supported. Rather than eliminating inflammation, the goal is to promote an effective but rapidly resolving immune response through targeted dietary strategies. Some tools include vitamin D_3, which can modulate immune signaling and reduce inflammatory markers, and omega-3 fatty acids, which help regulate the balance between pro- and anti-inflammatory pathways while improving resilience to stressors like heat and gut permeability. Additional approaches, including bioactive compounds like polyphenols, may further support mitochondrial function and reduce inflammatory signaling. Overall, he emphasized a shift toward "nutrition for robustness," where diets are formulated not just for production, but to support immune function and help cows better cope with the metabolic and environmental challenges of our modern dairy systems.
- Another favorite from Tri-State Dairy Nutrition Conference was Dr. **Jesse Goff**'s talk. He reinforced the idea that successful mineral management in transition cows hinges on both absorption biology and mineral solubility in an ionized form. Calcium absorption is tightly regulated by 1,25-dihydroxyvitamin D_3, which is critical at calving when cows suddenly lose 30-35 g of calcium through colostrum and milk. If cows fail to rapidly activate this pathway (often due to metabolic alkalosis from high-potassium diets or excess phosphorus inhibiting vitamin D activation), they are at greater risk for milk fever. Magnesium plays a central supporting role since it's required for both the secretion and function of parathyroid hormone, yet it can only be absorbed across the rumen wall in a soluble, ionized form. Poorly soluble Mg sources or antagonists like zeolites can limit availability, and high dietary potassium can further impair Mg absorption, ultimately disrupting Ca regulation. A Balchem podcast following this talk led to interesting discussion on Mg absorption and is worth a listen.
- Dr. **Barry Bradford** challenged Four State Dairy Nutrition and Management Conference attendees to think about where the next 5 pounds of milk will come from in modern dairy herds. While continued refinement of nutrition programs is important, he emphasized that substantial gains could come from addressing overlooked nutrients and improving transition cow health. A major theme throughout the presentation was that early lactation challenges create long-lasting production losses. Subclinical and clinical disorders like mastitis, metritis, and hyperketonemia not only reduce milk yield, but also impact fertility, increase culling risk, and lower herd productivity. Barry concluded that achieving the next major leap in milk production requires a combination of optimizing nutrition, preventing

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transition cow disease, and improving cow longevity so more cows actually reach their most productive lactations. The greatest opportunity for improving productivity may not be pushing peak milk higher, but instead preventing the health and metabolic disruptions during transition that create later losses in production, fertility, and longevity.

- Dr. **Mike Ballou**'s webinar on Understanding How Nutrition Modulates Immune Responses and Disease in Dairy Cattle elaborated on the idea that disease is not simply the result of immune suppression, but rather immune dysfunction, where the immune system either overreacts (excessive inflammation) or underperforms (reduced pathogen clearance). Cattle, especially transition cows and calves, are constantly exposed to pathogens, but disease only occurs when the immune response is poorly regulated. A "good" immune response is rapid, proportional, and self-resolving, minimizing collateral damage while also eliminating threats. This shift in thinking reframes health challenges like mastitis, respiratory disease, and gastrointestinal issues as failures in immune balance rather than simple deficiencies. Nutrition can modulate immune function through multiple pathways, including supporting barrier integrity, supplying key nutrients, influencing microbial populations, and directly regulating immune cell activity. Practical tools that can reduce pathogen load, protect gut health, and improve immune responsiveness can help, but no single intervention is sufficient. Instead, a targeted combination of nutritional strategies is needed to reduce intestinal damage, control inflammation, and improve animal performance under stress. The ultimate goal is achieving the right response, at the right time, then shutting it down to improve health outcomes and productivity in dairy systems.

Other notes:

1. Favero et al. (2026) evaluated a mined product of marine algae origin as a replacement for sodium bicarbonate in finishing diets for Nellore heifers, but the results were largely neutral. Across the 96-day trial, Beecomb maintained similar performance, feed efficiency, carcass traits, and nutrient digestibility compared to sodium bicarbonate, indicating it did not negatively impact productivity, but did not improve it. The only potential advantage reported was an ~8% reduction in methane production, which was not statistically significant (P = 0.08). This serves as a nice reminder that not all calcareous marine algae are created equal; land deposits are older and more compressed, limiting their bioavailability and other trace effects seen in ocean sources.
2. This work demonstrated that even short-distance transportation was sufficient to induce oxidative stress, evidenced by increased serum reactive oxygen species concentrations. Supplementation with a Chinese herbal residue blend rich in polyphenols and flavonoids reduced serum reactive oxygen species while increasing glutathione peroxidase, suggesting improved antioxidant defense capacity. The authors proposed that microbial fermentation of the herbal residues altered metabolic pathways that ultimately contributed to improved oxidative balance and immune status following transport stress.
3. Dr. Adam Lock's lab looked at how dietary starch level interacts with fatty acid supplementation in early lactation dairy cows. Higher starch diets improved milk yield and energy status, while supplemental fatty acids increased milk fat and feed efficiency but also elevated circulating NEFA and BHB. Interestingly, fatty acid supplementation was more beneficial in low-starch diets, highlighting that responses to added fat depend heavily on the overall dietary energy strategy

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4. Metagenomics work out of Texas State evaluated graded doses of thymol in forage-fed beef steers and found that thymol altered rumen microbial function in a dose-dependent manner without negatively impacting overall microbial diversity. The 240 mg/kg forage inclusion rate provided the best balance, increasing genes associated with energy production and amino acid metabolism. Many responses followed a quadratic pattern, suggesting that moderate supplementation may optimize rumen microbial efficiency more effectively than higher doses of this polyphenol.
5. An experimental liver abscess challenge study in Holstein steers demonstrated that repeated high-starch acidotic diet cycles, especially when combined with bacterial inoculation, caused intestinal and liver tissue damage. Steers exposed to these stressors exhibited shortened ileal villi, deeper crypts, increased inflammatory cell infiltration, and greater liver pathology, supporting the concept that nutritional and microbial stress can synergistically compromise gut integrity and promote systemic inflammation.
6. A recent lamb study evaluated a complete replacement of soybean meal with canola meal and found no negative effects on carcass traits or meat quality parameters, supporting canola meal as an alternative protein source in small ruminant diets. Clearly, there is a growing industry interest in improving protein efficiency and reducing reliance on soybean meal due to rising feed costs and pressure to optimize nitrogen utilization in livestock.
7. This feedlot study evaluating a high-solubility magnesium blend reported only minor impacts on lipid metabolism and beef quality, with no improvement in intramuscular fat deposition or overall carcass quality despite proposed rumen pH benefits. Steers receiving the Mg blend also exhibited elevated blood D-lactate concentrations, a marker commonly associated with increased ruminal acid load and fermentative stress. This is a nice reminder that magnesium source, chemical composition, and particle size can all dramatically influence MgO performance in the rumen. Beef cattle also tend to respond differently to alkalizers (such as MgO) or buffers (carbonates) compared to dairy cattle based on starch load, physiological differences, and management patterns.
8. This dairy calf study demonstrated that common stressors such as transportation, immune challenge, and vaccination increased oxidative stress and lipid peroxidation, leading to greater meat discoloration and reduced oxidative stability postmortem. Transported calves showed the greatest accumulation of malondialdehyde, reinforcing the connection between unmanaged stress, oxidative damage, and downstream impacts on meat quality.
9. This article in *Feed & Additive Magazine* highlighted the importance of evaluating mycotoxin binders under conditions that realistically simulate the gastrointestinal tract, rather than relying solely on simple adsorption tests. This serves as a nice reminder why broad-spectrum mycotoxin mitigation products should be evaluated across dynamic digestive conditions, not just static binding assays.
10. This *Journal of Dairy Science* review discusses the role of artificial intelligence in dairy production, mainly through computer vision systems and large language models. The authors discussed how these technologies can automate monitoring of traits like body condition score, animal ID, health status, and behavior in a noninvasive, high output manner. They also discussed the potential of integrating sensor data, farm records, images and scientific literature into AI systems to improve decision-making and disease prediction. While still evolving, it will be interesting to see if these technologies change how we monitor cows and make herd management decisions in the future.

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11. Researchers evaluated the use of ambient relaxation music as an environmental enrichment strategy in broiler chickens and found improvements in pectoral muscle quality. Birds exposed to music for 2 h/day throughout the rearing period had lower drip loss, higher post-mortem muscle pH, reduced collagen content, and improved meat color characteristics compared to controls, suggesting better muscle stability and lower pre-slaughter stress. Interestingly, the music-exposed birds also showed altered glutathione dynamics, supporting the idea that stress reduction may influence oxidative status and post-mortem meat quality. Relaxing music could serve as a simple, low-cost management tool to improve both welfare and product quality in poultry systems. Readers may remember we highlighted a similar value of relaxing music in dairy parlors last year and the same value has been observed in fish production with recirculating water systems.
12. A probiotic containing microbes native to the rumen was fed for 16 weeks and the cows receiving the microbial supplement produced more milk (+3.5 lbs/day), ECM (+4.9 lbs/day), and milk fat (+0.22 lb/day) compared with control cows, while DMI remained largely unchanged. As a result, feed efficiency improved by 0.09 units. Supplemented cows also had lower SCCs, suggesting potential benefits for udder health.
13. Dairyland Laboratories discussed canola meal variation in their most recent newsletter. Extruded canola meal was suggested to have both better protein and fiber digestibilities, and heat application correlates to both poorer protein (uN) and fiber (uNDF120) digestibility. Subscribing to their newsletter is free and a great way to keep track of developments in laboratory analyses before submitting samples.
14. DSM-firmenich highlighted in a recent web article how mycotoxin binding is not equivalent to mycotoxin degradation. While ruminant microbes are partially responsible for degrading mycotoxins, they need help in high levels of toxins within diets. Providing additives that target degradation of mycotoxins is a next-level solution to improve animal performance in challenging situations of high toxin dose or multi-toxin feed risks.
15. Ghimire and Ferreira (2026) published some of the in-vitro fiber degradation work that has been ongoing at Virginia Tech. Among other things, these data highlight how much variation exists in NDFd estimation based on grind size, bag type (and pre-processing), and wash cycles. It is absolutely normal to expected different lab results for NDF digestibility across labs within the US, both commercial and academic. The authors discuss that moving forward, we need to prioritize standardization of lab methods so that we can all better compare diets and for ages in ration balancing.

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