Below you'll find short summaries highlighting emerging research from the 2026 American Dairy Science Association Annual Meeting relevant to ruminant nutrition and health. All readers can find published abstracts linked here.

Presentations featuring Agolin:

- **Arshad et al. (Abstract #W235): Ruminal microbiota dynamics in the transition from confinement to grazing in dairy cows supplemented with essential oils.** Researchers at the University of New Hampshire evaluated the effects of supplementing Agolin® NATURU in Jersey cows transitioning from confinement to grazing. As expected, moving to pasture substantially increased rumen microbial richness, diversity, and evenness. Beyond these diet-driven changes, Agolin altered the rumen microbial community structure, particularly during grazing, and seemed to stabilize the microbiome by reducing between-animal variation in microbial populations. Supplementation increased the relative abundance of fiber-degrading bacteria that were negatively associated with methane yield and reduced the relative abundance of a *Methanobrevibacter* archaeal species linked to ruminal ammonia concentrations. As such, their findings suggest Agolin beneficially modulates the rumen microbiome during the transition to grazing and provides new insight into the microbial mechanisms underlying its effects on rumen function and fermentation.

Presentations featuring Calmin:

- **Naughton et al. (Abstract #438): Response surface modeling of dietary buffer inclusion and starch concentration on ruminal fermentation outcomes.** Investigators from Munster Technological University used a response surface modeling approach to evaluate how dietary starch concentration and supplementation with buffers (including Calmin) interact to influence rumen fermentation. As expected, increasing dietary starch in the modeled batch cultures reduced ruminal pH, but greater Calmin inclusion helped counteract this effect, with the greatest pH stability predicted in lower-starch diets receiving the highest dose. While total VFA production was largely unaffected, Calmin altered fermentation patterns by producing a quadratic response in acetate:propionate, suggesting it can influence rumen fermentation beyond pH. Methane production was variable and driven primarily by differences in rumen fluid donors rather than treatment. Ultimately, the work demonstrates the value of Calmin as a functional rumen buffer capable of supporting rumen pH across varying dietary starch concentrations, while illustrating how response surface modeling can help identify optimal inclusion rates for different feeding strategies.
- **Kientz et al. (Abstract #529): Effects of calcareous marine algae on immune responses in young dairy calves.** This work from the University of Alberta reinforced that immune development in young dairy calves is driven primarily by age and starter intake and also provided encouraging evidence that Calmin can beneficially influence aspects of immune regulation and gut health during the postweaning period. Across the study, inflammatory cytokines naturally changed as calves matured, with the highest pro-inflammatory activity occurring early in life and declining through weaning, highlighting the normal progression of immune maturation. While Calmin did not dramatically alter overall immune development, calves receiving the Calmin diet showed greater concentrations of the anti-inflammatory cytokine IL-10 in one postweaning group, suggesting improved resolution of inflammation under certain physiological conditions. The presentation also showed that Calmin-fed calves tended to have fewer ileal crypt abscesses, indicating a potential benefit for intestinal integrity. Because approximately 70% of immune cells reside within the gastrointestinal tract, Calmin's buffering capacity may help create a more favorable intestinal environment, supporting mucosal health, and moderating immune responses as

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calves transition to solid feed. Overall, the work suggests that although age and intake are the dominant drivers of immune maturation, Calmin may provide an additional nutritional tool to support gut health and promote a more balanced immune response during the stressful weaning period.

- **Sayles et al. (Abstract #530): Effects of age, calf starter intake, and calcareous marine algae supplementation on bone development in Holstein calves.** Calf bone development depends on more than just growth rate, it is influenced by both age and starter intake, and this sister study from Abstract #529 suggests the calcium source may also play an important role. The UAlberta group looked to see whether replacing part of the limestone in calf starter with Calmin affected skeletal development in young Holstein calves. As expected, older calves had greater body weight, higher bone volume, and thicker trabeculae (the structural framework within bone), while greater starter intake improved body weight and tended to increase hip height. Calves receiving Calmin had lower trabecular separation than those fed conventional inorganic calcium, indicating a denser bone microarchitecture that is generally associated with stronger, more resilient bone. Calmin also altered trace mineral deposition within bone, increasing strontium incorporation (a mineral linked to bone formation in other species) without affecting overall growth or major mineral deposition. Together, these findings suggest that Calmin may uniquely support improved skeletal strength during early life by enhancing bone microstructure rather than simply increasing bone size, providing a potential nutritional strategy to promote stronger calves and reduce the risk of fractures later in life.
- **Combs et al. (Abstract #T220): Effects of calcareous marine algae on inflammation and metabolism following immune activation in Holstein cows.** Dr. Lance Baumgard's group from Iowa State found that Calmin supplementation influenced both metabolic efficiency and the immune response of mid-lactation Holstein cows before and after an experimentally induced inflammatory challenge. Prior to the LPS challenge, cows receiving Calmin maintained similar ECM production despite lower DMI, resulting in a 19% improvement in feed efficiency. Calmin also reduced circulating inflammatory markers, including IL-8, with trends toward lower IL-6 and other pro-inflammatory cytokines, indicating a lower basal inflammatory state. Following the LPS challenge, Calmin altered immune cell dynamics by accelerating the rebound of neutrophils and monocytes after the initial decline, increased circulating LPS-binding protein, and tended to reduce the inflammatory chemokine MIP-1β, indicating a modified acute immune response and recovery. While Calmin did not prevent the temporary reductions in intake, milk production, or blood calcium associated with the LPS challenge, the findings suggest that Calmin may help improve nutrient utilization under normal conditions while supporting a more coordinated immune response during periods of inflammation.

Presentations featuring Betaine:

- **Osorio et al. (Abstract #544): Methyl donor impact on immunity, inflammation, and oxidative stress.** Dr. Johan Osario discussed the growing recognition that methyl donors (e.g., methionine, choline, betaine) play a much broader role in transition cow health than simply supporting methylation reactions. He reviewed evidence showing that cows enter a negative methyl donor balance around calving, when the demands for immune function, liver metabolism, and milk production are greatest. Adequate methyl donor supply helps maintain one-carbon metabolism, supports glutathione synthesis and antioxidant defenses, and improves redox balance, reducing excessive oxidative stress without suppressing necessary immune responses. Research also suggests methyl donors enhance innate immune function by improving neutrophil phagocytosis and oxidative burst capacity while supporting macrophage metabolism and inflammatory regulation. In

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addition, greater prepartum hepatic glutathione reserves may better prepare cows to withstand oxidative stress during the transition period. These findings strengthen the rationale for targeted supplementation with methyl donors including betaine to help improve transition cow health, resilience, and productivity.

- **Beltran et al. (Abstract #548): Efficacy of free betaine or complexed with trace minerals in hepatic oxidative and metabolic status.** Supplementing betaine increased expression of *BHMT*, an enzyme involved in recycling homocysteine to methionine, reinforcing betaine's role as an important methyl donor supporting one-carbon metabolism. Betaine also reduced expression of *SREBP1*, a regulator of lipid synthesis, suggesting a lower potential for hepatic fat accumulation and improved liver metabolic function. Though the strongest antioxidant gene responses were observed with the trace mineral-complexed form, the study provides additional evidence that betaine itself supports methyl-group metabolism and healthy hepatic lipid metabolism.

Khan et al. (Abstract #W245): Effects of pH modulation strategies and starch levels on pH, nutrient digestibility, and fermentation in continuous culture fermenters. Feedworks USA's own Dr. Wenner was involved in this study that evaluated whether a high-solubility magnesium blend (marketed as Phix-up) could provide more effective rumen pH control than the conventional combination of magnesium oxide and sodium bicarbonate, particularly in diets with differing starch concentrations. Using a continuous culture fermenter model, researchers found that the Mg blend consistently maintained a higher ruminal pH than the conventional buffer, regardless of dietary starch level, and this pH effect was driven by greater Mg solubility. While higher-starch diets improved starch digestibility and shifted fermentation toward more propionate and butyrate, the magnesium blend stood out by increasing both organic matter and NDF digestibility without altering total VFA production. These findings are a reminder that highly soluble Mg sources do positively impact rumen pH and including them may offer a more efficient strategy for supporting rumen function and fiber utilization, even when feeding higher-starch diets. Their work advances our understanding of rumen buffering strategies and highlights the potential value coordinating more soluble Mg with traditional rumen buffers.

Contreras et al. (Abstract #W219): Effects of omega-3 fatty acid supplementation during the transition period on adipose tissue metabolic function in early-lactation dairy cows. Supplementing transition cows with rumen-protected omega-3 FAs may help improve metabolic adaptation after calving by enhancing adipose tissue insulin sensitivity. In this study, cows fed a calcium salt enriched with EPA and DHA during transition showed a greater insulin-mediated suppression of fat mobilization in adipose tissue compared with control cows. While both groups responded similarly to a lipolytic stimulus, adipose tissue from the omega-3-supplemented cows was more responsive to insulin during early lactation, indicating improved metabolic regulation. These findings suggest that providing bioavailable EPA and DHA during transition may help moderate excessive lipid mobilization and the inflammatory remodeling of adipose tissue that often accompanies the onset of lactation. For nutritionists, the work adds to growing evidence that targeted omega-3 supplementation during the transition period can support healthier metabolic function, complementing previous research linking EPA and DHA to improved immune function and transition cow performance.

Alvarenga et al. (Abstract #349): Effects of a multi-mycotoxin challenge with or without a mycotoxin deactivating product on performance and plasma levels of mycotoxins in lactating dairy cows. Researchers evaluated the effects of a chronic, low-dose, multi-mycotoxin challenge in mid-lactation dairy cows using a combination of deoxynivalenol (1 ppm), fumonisins (2 ppm), zearalenone (0.4 ppm), and ochratoxin A (0.25 ppm), with each toxin included below

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current European Commission guidance values. Despite remaining under these limits, the combined mycotoxin exposure reduced DMI and decreased milk fat yield, with a tendency to lower FCM, highlighting that subclinical mycotoxin challenges can still negatively impact performance. While a commercial mycotoxin deactivating product was able to partially restore intake, recover milk fat yield, and alter plasma mycotoxin metabolites in a manner consistent with detoxification, the broader takeaway from this work is that multiple low-level mycotoxins can impair productivity even when individual contaminants wouldn't typically be considered problematic. These results add to the growing body of evidence that chronic, low-level co-contamination of multiple toxins deserves attention when developing proactive nutritional strategies to protect performance.

Liu et al. (Abstract #T117): Effects of heat stress and its duration on lactation performance, rumen fermentation, and gastrointestinal permeability in Holstein dairy cows. Heat stress significantly altered both production and gastrointestinal physiology in mid-lactation Holstein cows, with many responses becoming more pronounced as heat exposure continued. Cows housed under heat stress produced less milk and milk protein while also showing shifts in rumen fermentation, including lower total VFA production and a reduced acetate:propionate (driven by increased propionate production). Heat stress also increased markers of gut permeability, suggesting compromised barrier function, while elevating heat shock protein 70 and antioxidant enzyme activity, consistent with an adaptive cellular response to heat stress. Various production, fermentation, inflammatory, and oxidative stress measures changed over the 15-day challenge, highlighting that the duration of heat exposure is an important factor influencing the severity of physiological disruption. These findings reinforce the idea that heat stress extends well beyond reduced feed intake, affecting rumen function, gut integrity, and metabolic resilience over time.

Bruinjé et al. (Abstract #457): Systemic inflammation in early postpartum cows: Associations with metabolic markers, health, and performance. This large prospective study of over 1,500 Holstein cows highlighted that systemic inflammation during the first week after calving can identify cows at risk for poorer health and performance, even before obvious clinical disease develops. They found that postpartum cows with lower blood calcium and higher NEFA and BHB concentrations were more likely to have elevated haptoglobin (a marker of systemic inflammation), especially in cows without pre-existing calving disorders. Those inflamed cows subsequently experienced substantially higher rates of metritis, purulent vaginal discharge, and endometritis, produced about 3.7 lbs/day less milk at their first test, had lower pregnancy success at first AI, and were less likely to achieve a lactation with good health, production, and fertility. Their findings reinforce the close connection between metabolic status and inflammatory responses during the transition period and suggest that early metabolic disturbances may set the stage for downstream health and productivity losses, supporting the value of nutritional and management strategies aimed at minimizing postpartum inflammation before clinical disease becomes apparent.

Sockett et al. (Abstract #518): Long-haul beef-on-dairy calves: Critical needs upon arrival. This presentation highlighted the unique physiological challenges faced by beef-on-dairy calves after long-distance transport and reinforced the importance of targeted receiving strategies. Researchers evaluated 171 calves following a 12-hour haul and found that while most calves had adequate passive transfer and maintained normal electrolyte balance, more than 1/3 showed evidence of elevated serum osmolality consistent with dehydration, and hypoglycemia was surprisingly common, especially (nearly 40%) among the calves with poor passive transfer. Despite these metabolic changes, calves showed few outward clinical signs, suggesting that transport-related stress can be easily overlooked without appropriate monitoring. The authors

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concluded that additional research is needed to define the ideal composition and osmolality of oral electrolyte solutions for long-haul calves and noted that calculated osmolarity may provide a practical on-farm assessment tool. Their findings reinforce the value of comprehensive receiving protocols that address hydration and electrolyte balance and also support energy status immediately after transport, highlighting the potential role of well-formulated oral electrolyte products as part of successful arrival management.

Broadway et al. (Abstract #155): Developing a new model to evaluate pathogenesis and potential therapeutic solutions to liver abscesses in cattle. This presentation described the development of a repeatable experimental model for studying liver abscesses in cattle, addressing a major challenge in evaluating new prevention and treatment strategies. By inoculating calves with *Fusobacterium necrophorum,* with or without *Salmonella Lubbock,* researchers consistently induced liver abscesses in about half of the animals, while the addition of *Salmonella* increased both lesion severity and diaphragm adhesions. Surprisingly, altering dietary acidosis, rumenitis, bacterial dose, or inoculation frequency had little effect on abscess development in this study, suggesting that the traditional view of ruminal acidosis as the primary driver of liver abscesses may be incomplete. Instead, the findings point to the hindgut as a potentially important route for bacterial translocation into the liver. The researchers also found that liver abscesses could form and nearly resolve within just 28 days, meaning they may be more dynamic than previously thought.

Zanton et al. (Abstract #448): Rumen microbial protein: What we know, what we don't, and what's next. This presentation reviewed the central role of rumen microbial protein in converting lower-quality N sources into the high-quality amino acids that support milk production, while emphasizing that accurately predicting microbial protein supply is one of the biggest challenges in dairy nutrition. Although balancing diets for metabolizable amino acids has improved N use efficiency, they noted that current methods for estimating microbial protein flow are still highly variable due to factors like microbial turnover, marker accuracy, and sampling techniques. Looking ahead, they suggested that combining traditional in vivo and in vitro research with multi-omics, advanced modeling, and artificial intelligence could improve predictions of microbial protein synthesis and amino acid supply. For nutritionists, the major takeaway is that better understanding and predicting rumen microbial protein production will be essential for improving feed efficiency, reducing N losses, and formulating more precise protein programs. As our ability to optimize the rumen continues to improve, nutritional strategies that support a stable, efficient rumen environment will likely become increasingly valuable components of precision protein nutrition.

Lopreiato et al. (Abstract #275): Physiological and molecular responses to heat stress: Modulatory roles of amino acids and plant polyphenols in dairy cow resilience. This presentation highlighted evidence that heat-stressed cows exhibit unique metabolic adaptations, including elevated insulin and reduced circulating NEFA compared with pair-fed cows, indicating that heat stress alters nutrient metabolism rather than simply creating a negative energy balance. At the cellular level, heat stress remodels gene networks involved in mitochondrial function, inflammation, antioxidant defenses, and amino acid metabolism. Two promising nutritional strategies to improve resilience were discussed: functional amino acids involved in one-carbon metabolism, which support glutathione synthesis, redox balance, and immune function; and plant polyphenols, which enhance antioxidant capacity, improve thermoregulation and innate immune cell activity, and reduce inflammation through activation of the Nrf2 pathway and increased glutathione availability. The overall message was that while cooling systems remain the first line of defense, nutritional interventions targeting oxidative stress and

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immunometabolic function can add an extra layer of protection, helping maintain health, metabolic stability, and productivity as heat stress becomes an increasingly common challenge.

Bermeo et al. (Abstract #T283): Magnesium source selection and quality concerns in lactating dairy cow diets: A survey of US dairy nutritionists. A survey of 32 US dairy nutritionists found that practical considerations, not just cost, drive Mg source selection in lactating cow diets. Feed mill availability was the most influential factor (54%), followed by perceived source quality (33%), while price ranked a distant third (13%). Magnesium oxide remained the most commonly used Mg source, with calcium magnesium carbonate also widely included, and most nutritionists targeted dietary Mg concentrations of 0.30-0.40% DM. Notably, more than half of respondents expressed concerns about the quality of commercially available Mg sources, and 84% said they wanted more information on Mg solubility to help guide their formulation decisions. Although most respondents reported few cases of mid-lactation milk fever, the survey highlights growing industry recognition that not all Mg sources perform equally. As such, there is a need for better characterization of source quality and bioavailability when formulating rations.

Bradford et al. (Abstract #271): Nutritional interventions to modulate inflammatory status of transition cows. Dr. Bradford discussed the growing recognition that postpartum inflammation is a major driver of transition cow performance and that nutritional strategies can offer a practical way to help manage inflammation. The literature consistently shows that cows experience a natural inflammatory response after calving, but animals with more severe or prolonged inflammation are more likely to suffer reduced milk production, poorer fertility, and health disorders. While studies using NSAIDs support the idea that controlling inflammation can improve outcomes, researchers are increasingly focused on nutritional alternatives that are more practical for routine herd management. Promising approaches include polyphenols, omega-3 FAs, and other dietary strategies designed to reduce oxidative stress, support gut integrity, and strengthen immune function before any infections occur. Though many of these interventions have demonstrated biological benefits in controlled studies, he noted that larger field trials and economic analyses are still needed to confirm a true return on investment.

Onan-Martinez et al. (Abstract #265): Effects of heat stress on fecal microbiota of dairy cattle at different life stages. This work examined how heat stress alters the fecal microbiome of dairy cattle at different stages of life, including during lactation, after dry-period heat stress, and in calves exposed to heat stress before birth. Using 16S rRNA sequencing, the researchers found that acute heat stress in lactating cows significantly changed the composition of the gut microbiota, increasing overall microbial diversity but also increasing the abundance of bacterial groups associated with pathogens. Cows that experienced heat stress during the dry period also exhibited lasting changes in their fecal microbiota into the following lactation, despite showing no differences in overall microbial diversity, suggesting that heat stress can have persistent effects on the ecosystem of the GIT. In contrast, calves exposed to heat stress in utero showed minimal differences in gut microbiota at weaning. Overall, the findings indicate that heat stress can reshape the dairy cow gut microbiome in ways that may compromise gut health and digestive efficiency, while also highlighting that dry-period heat stress may have carryover effects well beyond the initial heat exposure.

Omale et al. (Abstract #539): Determining the durations for carryover effects of *Asparagopsis taxiformis* in dairy cows. Dr. Appuhamy's group from Iowa State University evaluated how quickly the effects of feeding the methane-inhibiting seaweed *Asparagopsis taxiformis* (AT) disappeared after the additive was removed from the diet. Late-lactation cows received 0, 0.3, or 0.6% DM AT for 63 days before withdrawal for 16 days. As expected, AT substantially decreased

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methane emissions (45-57%), but the methane-suppressing effect disappeared within the first week after supplementation ended. At the higher inclusion rate, AT also reduced DMI by over 40%, though intake recovered within two weeks after withdrawal. Feeding AT increased milk concentrations of bromoform, bromine, and iodine during supplementation, but bromoform and iodine returned to baseline within 5 days of withdrawal, while bromine required ~15 days to return to baseline levels. Overall, their results suggest that although milk residue concerns resolve quickly after AT removal, the methane mitigation benefits are only maintained with continuous supplementation and come with tradeoffs in feed intake at higher inclusion rates.

Pharo et al. (Abstract #M171): The association between postpartum calcium dynamics with inflammatory characteristics and rumination time in organic Jersey cows. This study extends transition cow research into the understudied population of certified organic Jersey cows and reinforces the close relationship between calcium status and inflammation after calving. Dr. Seely's group monitored blood Ca, the inflammatory biomarker serum amyloid A, and rumination behavior in 36 multiparous cows during the first week postpartum. Cows that remained dyscalcemic through 4 DIM had significantly lower blood Ca concentrations, and cows with persistently elevated inflammation tended to have lower Ca concentrations than their herdmates, suggesting an important interaction between Ca homeostasis and immune activation. Interestingly, cows with chronic inflammation also tended to spend more time ruminating postpartum than intermittently inflamed cows, highlighting that rumination behavior alone may not always reflect underlying inflammatory status.

Kim et al. (Abstract #T289): Effects of reducing dietary CP and DCAD on production and N utilization in lactating cows. An ongoing discussion surrounds what level of +DCAD is "enough" in lactating cows, with many readers pointing to studies such as this one. However, it's important to note that the "lowered DCAD" in this study is actually negative while the control DCAD is fairly low compared to industry patterns (+200 mEq/kg). Thus, it's logical that the -DCAD diet did decrease milk and milk protein as flow was impacted by lack of cations. However, milk production scaled to DMI was not affected in this study. Negative DCAD treatments increased fat mobilization as evidenced by blood measures and points to the -DCAD not only mobilizing Ca from bone but increasing fat mobilization as well. The authors propose that -DCAD impaired the efficiency of dietary AA utilization for milk protein.

Branco-Lopes et al. (Abstract #T250): Nationwide survey of dairy nutritionists on the use of methane-reducing feed additives. The survey data had a greater number of respondents in the Midwest area. Among those, 40% of nutritionists indicated they have no dairies using methane-inhibiting products in their diets. Top issues of importance were productivity (95%), financial incentive (90%), and ease of integration (86%).

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