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.

Treatment of dual-flow continuous culture fermenters with an organic essential oil product minimally influenced prokaryotic microbiome (Park et al., 2024): This study was a collaboration at Ohio State using dual-flow continuous culture fermenters to evaluate Agolin Naturu and better understand its mechanisms for decreasing methane in ruminant cultures. In a parallel study still in-press, methane was decreased in cultures by ~10%. Thus, we wanted to see what changes occurred in the microbial population during this treatment. Cultures treated with Agolin caused an apparent offset of some fiber digesting bacteria (e.g. Rikenellaceae) in favor of others such as Treponema, Ruminococcus, and Succinivibrionaceae. At the level of predicted gene pathways, this change in microbial genera was expected to decrease H_2-producing bacteria in favor of H_2-utilizing bacteria. Since methanogens themselves were largely unaffected by treatment and protozoa were a negligent portion of the population, it is highly likely that Agolin decreased methane emissions by shifting bacterial populations to **use** more hydrogen for carbon skeleton elongation (such as H-sinking VFA) rather than methanogenesis.

Effects of Coix seed polyphenol extract on rumen fermentation, milk production, fatty acid profile, antioxidant activity, and polyphenol content in dairy goats (Tian et al., 2025): This study investigated the effects of a polyphenol-rich Coix seed extract (CSE) on rumen fermentation, milk production, fatty acid profile, antioxidant activity, and polyphenol content in the milk of dairy goats. Research in pigs had previously shown that CSE improved gut micobiota and post-weaning performance; the investigation here was interested in how CSE would perform in a ruminant tract. Lactating goats (n=40) were divided into four groups and fed diets with varying levels of CSE (0, 1.5, 3.0, and 4.5 g/kg of TMR). Increasing dietary CSE levels appeared to enhanced rumen fermentation, as indicated by higher total VFA *concentration* – it is an important observation that the polyphenol dose *improved* rumen fermentation rather than negatively interacting with the

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microbial population. Milk production and milk components increased quadratically with the lower dose being most effective. Additionally, CSE supplementation improved antioxidant activity in both plasma and milk, evidenced by increased total antioxidant capacity, catalase, and DPPH scavenging activity. Polyphenol compounds, including gallic acid, catechin, apigenin, and kaempferol, were also significantly increased in milk with higher CSE inclusion. This data suggests that polyphenol-rich CSE supplementation could be optimized to enhance milk production, improve milk quality, and boost antioxidant capacity in dairy goats, with lowest dose in this study being most effective.

Live Presentations:

The **Florida Ruminant Nutrition Symposium** at the end of February had several great speakers we haven't had space to highlight yet. Please see the symposium website to access a free copy of the proceedings from the following (and many other) great talks:

1. Dr. Firkins spoke about strategies and research surrounding maximization of rumen microbial efficiency:
    - A key feature of starch degradation (beyond its negative effect on fiber degradation) is that amylolytics are "sprinters" in terms of fermentative activity. This race to outcompete other bacteria can often lead to inefficient use of energy unless N-source is paired to carbohydrate degradation.
    - There are unknown "growth factors" within rumen fluid (such as branched-chain carbon skeletons) that can quickly become deficient when increased starch in the diet increases generalists who can outcompete fibrolytic bacteria. This is one instance where BCVFA can improve fiber digestion (microbial efficiency).
    - Bacteria (especially amylolytics or generalists) can use carbohydrates for "non-growth functions" and there is evidence they spill energy as protons, upregulate genes that are faster/less efficient, and/or cycle glycogen to maximize storage yet compete with other bacteria. Protozoal capture of starch can actually help decrease this inefficiency (do we actually need to kill them off?)

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- There is evidence of fatty acids being used by bacteria – not unlikely that bacterial efficiency can be influenced by dietary fat and fatty acid composition of diet.

2. Dr. Vyas spoke on enhancements of fiber digestibility and a key table he spoke through highlights how crop health can influence digestibility of the fiber. He illustrated this with a hybrid corn silage study where NDFd was equivalent between healthy and sick corn plants. However, a week later, there was a 14-pt difference in fiber digestibility between the same two fields. Plant illness can significantly accelerate dry-off.

3. Dr. Bach discussed in detail the differences between alkalizers and buffers as part of the commercial roll-out for a high-quality MgOx that functions as an alkalizer in dairy diets.
    - Alkalizers are defined as ingredients that cause immediate pH change and raise the pH in the rumen upon feeding. Mg oxides are typically at the top of this list and highly soluble Mg oxide will quickly raise the rumen pH.
    - Buffers on the other hand exchange H+ in an effort to stabilize pH around a specific pH range (at least until the buffer is exhausted).
    - An interesting web application (photofiber.net) was discussed which was developed to try and evaluate peNDF of TMRs by picture. Of course, peNDF stimulates chewing and salivary buffering by the cow herself.
    - Bach argued that a significant proportion of the effect of sodium bicarbonate is within its reaction to increase TMR pH itself. Increasing TMR pH increases palatability and intake, and prevents dramatic pH declines at intake.
    - Older literature on bicarbonate feeding in dairy cow diets indicated that you need at least 0.25 lb to see a positive effect on milk response in the cow. Taking bicarbonate below this level (including substitution with buffers like Calmin or an alkalizer such as pHix-up) could limit effectiveness of the remaining bicarbonate – maybe related to the TMR buffer effect (above).

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4. Dr. Fraser made the room stir a bit when he said his data indicate up to 50% of Ca can be absorbed through the rumen wall. While this number sounds unlikely due to concentration gradients, his later discussion on the essentiality of rumen motility for Ca absorption is something worth remembering. In that post-fresh cow with poor rumen motility, Ca absorption through that rumen wall will certainly be minimized.

Feedworks USA's own, Minnie Ward, was a featured speaker at **Central Plains Dairy Expo** this year. Her talk focused on optimizing calf health through effective management, nutrition, and immunity strategies. She emphasized that calf care should be approached on a case-by-case basis dependent on what works best for the producer. Regardless of the approach taken, it's important to have written protocols for every stage of calf development: newborn care, the period from 2 days old to weaning, and weaning to 4 months. The presentation highlighted the "5 C's" of calf care: Colostrum (ensuring proper timing and quality), Calories (adequate nutrition), Consistency (in feeding and environment), Cleanliness (environment and equipment), and Comfort (proper bedding, temperature, and ventilation). A key focus of the talk was on preventing dehydration, which she identified as one of the leading causes of calf mortality. She recommended providing electrolytes to support hydration and prevent metabolic acidosis, emphasizing that proper hydration should be prioritized within the first 21 days of life. Minnie also addressed the impact of various stressors like changes in routine, housing changes, and transportation on calf health, encouraging consistent protocols and attention to calf comfort to reduce the risk of disease and performance issues. This serves as a good reminder that you can't out-feed bad management; a well-rounded, carefully managed approach to calf health goes beyond just nutrition. If you missed Minnie at Central Plains Dairy Expo, be sure to catch her at our mini symposium at Tri-State Dairy Nutrition Conference on April 14th!

Other notes:

1. Pinkerton et al. (2025) published a paper this month with Feedworks USA's own Dr. Wenner that evaluated the effect of parlor music genre on milk production by dairy cows. There are a few limitations to the

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study design, including only afternoon milking data capture, but the end point of this study is that classical music clearly led to the greatest milk release by the cows. This gives rise to an important question: Is the music choice affecting the cows directly? Or is the music choice having a calming effect on the employees which translates to a smoother parlor experience for those cows? More to follow.

2. A January review by Kusza and Bagi (2025) provided an in-depth comparative genomic analysis of major bacterial pathogens associated with either bovine mastitis or lameness, specifically focusing on *Staphylococcus aureus*, *Escherichia coli*, *Fusobacterium necrophorum*, and *Treponema phagedenis*. The study compiled data from >4,300 bacterial isolates from global databases and looked for distinct genomic patterns in terms of virulence factors, antimicrobial resistance, and geographical distribution. *E. coli* and *S. aureus* were found to exhibit the highest genomic diversity and antimicrobial resistance, with regional variations indicating localized adaptations to environmental conditions, but there was evidence of rising concerns for antimicrobial virulence within *T. phagedenis*. The review also highlights the evolution of antimicrobial resistance genes, particularly in intensive dairy farming regions, and the importance of regional strategies for disease management. The authors emphasize the potential for targeted diagnostic tools and therapeutic approaches to improve bovine health management and reduce the economic impact of these diseases on the dairy industry. We would also remind the readers that there is some limited evidence the mineral source fed (esp. sulfates) may lead to increased *Treponema* spp. excretion in fecal slurry (Wenner et al., 2022).
3. Paglarini et al. (2025) looked potential commercial plant extracts as antioxidants in cooked and frozen meat patties made from beef, pork, chicken, and mechanically deboned chicken meat. The plant extracts tested included grape, rosemary, green tea, and mate, compared with the synthetic antioxidant butylated hydroxytoluene (BHT). Plant extracts, especially grape and green tea, were more effective in inhibiting lipid oxidation than BHT. These natural extracts delayed the onset of warmed-over flavor in cooked meat and prevented oxidation in frozen patties as well. Mate extract, however, acted as a pro-oxidant in pork patties when frozen. Plant-derived extracts may be a promising,

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healthier alternative to synthetic antioxidants in meat products, with potential for extending shelf life and maintaining product quality. Similar preservative effects were postulated for anthocyanins transferred to cow's milk in this recent paper.

4. Schnur et al. (2025) sought bacteriophages in rumen fluid or human sewage with lytic (breaking down/killing) activity to Fusobacterium necrophorum subsp. necrophorum, a bacterium found in cattle liver abscesses and thought to be at least partially responsible for causing them. The authors used a lysine-enrichment process to increase the likelihood of isolating bacteriophages and a total of 68 F. necrophorum strains were tested across multiple sampling dates. The study found that bacteriophage isolation was significantly more frequent in city sewage (ranging from 13.7% to 32.0%) compared to ruminal fluid (0% to 25.4%). This highlights the potential of using sewage as a rich source for bacteriophages, potentially creating an effective intervention for F. necrophorum in cattle in replacement for antibiotics.
5. Spent coffee grounds represent significant environmental waste and acidity make them a challenge for end-uses. Medjabi et al. (2024) tried feeding grounds to Latxa ewes in a replicated 4 × 4 Latin square design, receiving diets with varying levels of SCG: 0, 100, 150, and 200 g/kg DM. There is limited inference from this paper because the wash-out period between treatments only gave microbes a 7-d adaption window. However, results showed a dose-dependent reduction in methane emissions per unit of organic matter intake, attributed to phenolic compounds inhibiting methanogenic microbes. Meanwhile, increasing SCG levels also decreased the digestibility of crude protein and starch. Microbial protein efficiency in the rumen improved linearly with SCG inclusion and more research is needed to investigate this opportunity.

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