

## 30 Years On: Adisseo Emphasizes the Importance of Rumen Protected Methionine in Dairy Nutrition

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This is what Dr. Brian Sloan, Adisseo's Global Director of Ruminant Amino Acids and Protected Nutrient Business shared with Feedinfo in a recent chat ahead of the company celebrating the 30-year anniversary of its journey to provide amino acid (AA) balancing solutions for the benefit of the dairy industry.

“Formulating on an amino acid basis was readily accepted in monogastric nutrition more than 50 years ago as a mainstream practice for optimising performance and health. The dairy industry, however, has been ultra conservative in its acceptance, with less than five million dairy cows worldwide currently receiving a diet balanced for AAs,” he shared. “Rumen protected AAs were developed as ingredients to provide high concentrations of metabolizable methionine and lysine for use in better formulating diets. Yet the industry viewed them primarily as feed additives to improve milk protein production. The practice has been to use them only when the economics of milk protein payments are viewed as favourable.

While amino acid balancing has been common practice in monogastric nutrition for decades, its mainstream adoption by the dairy industry has trailed behind. And this despite rumen-protected methionine solutions being around since the 1990s, which greatly improved the ability to formulate dairy diets based on this first limiting, essential amino acid.

This ignores the broader need of the modern dairy animal for limiting AAs, such as methionine and lysine. Both are essential nutrients.”



**Dr. Brian Sloan**

*Global Director of Ruminant Amino Acids and Protected Nutrient Business*  
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In this Industry Perspectives, Mr. Sloan chats with us about these broader needs of the dairy cow and explains how improved methionine supplementation can help with so much more than just milk protein production. This includes supporting the physical and reproductive health of dairy cows, extending their productive lives, and, of course, farm sustainability.

**[Feedinfo] It has been 30 years since you launched Smartamine M. How has the industry's knowledge of AA balancing in dairy nutrition changed since then?**

**[Brian Sloan]** Thirty years ago, a long-awaited breakthrough changed dairy nutrition. The introduction of rumen protected methionine made possible a critical first step in the ability of nutritionists to begin balancing the level of AA in rations. Rumen protection of methionine, the first-limiting AA for dairy, advanced the ability of nutritionists to precisely formulate rations.

Dairy is now starting to catch up to monogastric nutrition in which balancing the level of various AAs in rations has been routine for some time. Balancing AAs better supplies the ruminant animal's needs for these essential nutrients for use in bodily functions. This improves production and efficiency, but that is just the tip of the iceberg. The essential AA methionine is involved in numerous metabolic pathways. When these pathways have adequate methionine, it shows not only in better production, but improved health status, reproductive performance, herd longevity and positive consequences on dairy farm sustainability.

Today we know that meeting the methionine needs of dairy cows is critical throughout lactation and throughout the dry period in preparation for the onset of the next lactation. With the use of established best practices, AA balancing begins at least three weeks before calving to enhance dry matter intake (DMI) and milk performance postpartum, reduce metabolic disorders, and improve reproductive performance. By setting the cow up right in the transition period, enriching diets with methionine bears dividends throughout lactation. Gains in milk component yield generated prior to peak lactation hold through the rest of lactation. As milk yields decline in later lactation, the gain in component yield is seen as a further increase in milk component percent.

The rumen needs methionine too, particularly in the analogue form (HMTBa a.k.a. RumenSmart™). Feeding HMTBa equal to 0.1% of dry matter intake optimises rumen function and mitigates milkfat depression. Feeding this combination of supplementary metabolizable methionine plus rumen-available HMTBa magnifies the effects on milk and milk components.

**[Feedinfo] How has Adisseo ensured Smartamine M and its encapsulation technology remain relevant to the needs of the modern dairy industry? What were some of the advances introduced in the last three decades?**

**[Brian Sloan]** Producing high-quality rumen protected AA supplements requires a high level of technical expertise in order to produce a consistent, high-performing protective coating. As a leader in this

business for 30 years, Adisseo understands this challenge.

Current products are far from being created equal. Nutritionists should not use products that have not undergone rigorous, documented, and transparent evaluations of how much of the AA they contain gets absorbed. It is apparent that achieving high-quality and consistent products takes extraordinary refinements of encapsulation/protection technology.

Various *in vitro*, *in situ* and *in vivo* methods have been used to arrive at estimates of bioavailability of lysine and methionine from rumen-protected AA supplements. The method that has come to stand out as the industry's gold standard is the plasma free-amino-acid dose response method. Its estimates of AA bioavailability are consistent with how the product is fed. The bioavailability of Smartamine M is 80%, which is top of the class.

**[Feedinfo] Of course, since the launch of Smartamine M, sustainability has exploded in importance and a key objective for the dairy industry has become optimising the use of dietary nitrogen (N) to limit environmental contamination. What do nutritionists get wrong in their approach to this concept, and how do you suggest to effectively implement AA balancing to reduce nitrogen excretion?**

**[Brian Sloan]** As in all farm species, one of the premises for AA balancing has always been to optimise the efficiency of use of dietary N by reducing protein intake and thus minimising urinary N excretion. The impact AA balancing can have on reducing the environmental impact of excessive

protein feeding is huge.

Improvements of 60% in N utilisation are within reach when properly implementing AA balancing, reducing the potential negative effects of N excretion on the environment (runoff, eutrophication, water quality, and nitrous oxide generation). This is not counting the positive effect on reducing the carbon footprint. For every one percentage point that AA balancing decreases the crude protein content of rations, the carbon footprint is reduced by an average of 10%.

However, to do this effectively, the industry must let go of formulating to outdated concepts both of minimum levels of crude protein and of metabolizable protein levels in dairy diets. Both perpetuate the overfeeding of protein in diets.

**[Feedinfo] And considering the health and reproductive benefits of enriching methionine levels in diets by using rumen-protected products, what should nutritionists keep in mind when developing their methionine strategies?**

**[Brian Sloan]** Diseases common during the transition phase take a toll on the herd and burden the economics of milk production. The weeks following parturition are critical to cow health. A high incidence of diseases and involuntary culling occurs during this period of the lactation cycle; the associated costs are very high. Despite the large variation in the incidence and costs to resolve the maladies affecting different herds, the common underlying factor is the cost. Milk fever, dystocia, retained placenta/metritis, ketosis, left displacement of the abomasum, clinical mastitis, and

lameness represent the majority of the clinical conditions of dairy cows.

Feeding diets during the transition phase that are enriched with rumen-protected methionine has been shown by research and field practice to help dairy cows. Methionine facilitates the secretion of fat from the liver. Cows fed diets enriched with a rumen-protected methionine had improved liver function, reduced inflammation and reduced oxidative stress.

Post-fresh cows fed commercial protected methionine sources increased DMI. This resulted in more milk, energy corrected milk, milk protein and milk fat. Cows receiving supplemental rumen-protected methionine had enhanced immunity which prevented subclinical mastitis. In these ways, enriching the methionine level in diets with a rumen-protected product results in significant savings by supporting cow health and wellbeing.

Changes in AA concentrations in the uterus accompany the different stages of embryo development. In research trials, cows supplemented with a rumen-protected methionine product produced large embryos with a higher lipid concentration than control cows. The lipid potentially serves as an important source of energy for the early developing embryo. Lower pregnancy losses from cows fed diets enriched with a rumen-protected methionine suggest that methionine favours the embryo's survival in multiparous cows.

**[Feedinfo] Your research also identified that AA balancing can have a positive effect on dairy cow longevity and extend her productive life. Exactly how long are we**

**talking here? What is a reasonable expectation of increased longevity with improved methionine supplementation?**

**[Brian Sloan]** Getting AA balancing right in concert with all the other important nutrient inputs creates an opportunity in terms of dairy cows staying in the herd longer and having a more productive life. The clear advantages of AA balancing on maximizing energy corrected milk while positively impacting health and reproduction reduces the incidence of involuntary culling. Healthier cows and shorter calving intervals allow high-performing cows to remain in the herd longer and pay back the producer for the heavy investment needed to rear heifers to first calving.

**[Feedinfo] Going back to sustainability, considering the chemically complex process of producing a coated or protected methionine, what advances has Adisseo implemented in the Smartamine M production process to make it more environmentally friendly to bring to market?**

**[Brian Sloan]** At Adisseo, the efforts of top research scientists have provided continuous improvement in manufacturing technology and processes. The gains made have streamlined production while evolving the end product and benefitting the environment:

- The zero-waste objective implemented in 2021 by Adisseo has resulted in environmental and manufacturing wins. Small particles that escape the manufacturing process are automatically fed back into the system. No waste means no landfill or destruction needed which

reduces the energy and carbon footprint cost.

- Manufacturing improvements have increased yield and reduced costs.
- Use of today's technology requires a high level of knowledge and experience, precise formulation, and specialised equipment.
- Process controls enable 100% conformity, a high standard.
- And Adisseo optimises shipping containers with the goal of having a high percent of production shipped directly to customers in full containers.

**[Feedinfo] Finally, is there more to explore in terms of AA balancing in dairy cows?**

**What other advancements in this area are Adisseo excited about? Any developments we should keep an eye out for in future?**

**[Brian Sloan]** Modern ration formulation software simplifies AA balancing for dairy nutritionists, such as the Cornell Net Protein and Carbohydrate System Version (CNCPS v6.55). The development of ration software packages that include the most up-to-date approaches to AA balancing brings the benefits within easy reach of nutritionists for the benefit of their producers.

An eagerly awaited event in 2023 will be a ground-breaking update of CNCPS with the launch of v7 with a state-of-the-art rumen submodel. It will be the first of its kind to take into account the important role of protozoa in the digestion of carbohydrates, predation of bacteria and contribution to the post-ruminal supply of AAs, particularly lysine. AA recommendations will be extended beyond methionine and lysine. This allows another giant step forward in precision nutrition and better efficiency and economy of the dietary N we feed to dairy cows.

AA balancing is more relevant today than ever before. Our knowledge base continues to expand through our extensive research programme and the insights gained over 30 years of AA balancing. Today, dairy nutritionists and their producers can produce milk in a more sustainable way, even with high feed costs. Adisseo would hope that all dairy farms will adopt AA balancing as it helps them cope with today's volatility, uncertainty, complexity, and ambiguity (VUCA) while supporting the planet long term.

*Published in association with Adisseo*