

## Adisseo Champions Improved Amino Acid Nutrition to Help Dairy Producers Tackle Climate Challenges

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As the world faces growing climate and sustainability challenges, the demands we have placed on the modern dairy cow have followed suit. She now has to contend with the increased incidence of heat stress brought on by rising global temperatures while maintaining milk quality and a profitable level of production. She is also vital to the dairy industry's various initiatives to improve its sustainability score.

Nutrition has always played an important role in helping dairy cows meet various production expectations and, in today's Industry Perspectives, Adisseo reaffirms its position as a valuable partner to dairy producers in helping them address key climate and sustainability challenges through improved amino acid supplementation. What follows is a discussion with the company's Regional Category Manager for EMEA, Robert Bennett, on how Adisseo's methionine solutions can help farmers manage heat stress in the age of climate change, improve protein utilisation to combat nitrogen emissions, and combat milk fat depression brought on by dietary changes.

**[Feedinfo] So looking at heat stress first, what is the scope of management required today?**

**[Robert Bennett]** The earth's climate is changing as evidenced by heat waves, forest fires, and floods. For dairy cows, this means more heat stress days per summer. In the UK, for example, heat stress historically affected dairy cows about a week per year. In southern England, heat stress now is

expected to reach one to two months in the coming years.

In the Netherlands in 2020, the town of De Bilt had 110 warm days, i.e., temperature higher than 20°C. This means that for almost one third of the days in 2020, dairy cows in the Netherlands were at risk of heat stress. The expectation is that heat stress situations will become ever more intensive in Southern Europe.



**Robert Bennett**  
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Current losses to heat stress are estimated at 100 to 200 USD/dairy cow/year. Adding to this are the veterinary costs associated with the increased incidence of mastitis and acidosis, among other disorders, due to heat stress. These losses can be as high as several hundred dollars per dairy cow per year. As global temperatures rise and heat waves become more frequent, economic losses can be expected to increase. Adjusting management practices is important.

To mitigate heat stress, many herd management actions can and should be carried out. First among these are access to water, offering shade, and the use of ventilation and sprinklers. Cows also benefit when dairies adapt to the rhythm of the day to minimise heat stress' impact, (i.e., the timing of movements, feeding, etc.) and avoiding other stress factors.

Nutrition plays an important part as well. Adjust minerals to compensate for losses from increased sweating and urination. Bolster antioxidant defence systems through supplementation with vitamins E and C, carotenoids, flavonoids, and a highly available organic selenium source such as Selisseo®.

To further mitigate heat stress, balance the ration's amino acid levels with Smartamine® M, our rumen-protected methionine, or MetaSmart®, the isopropyl ester of the hydroxy analogue of methionine. Doing so improves performance and metabolism.

**[Feedinfo] Rumen-protected methionine's effect on lactation performance, and milk fat and protein concentrations has been well documented. But you are also putting**

**it forward as an effective tool in mitigating heat stress. Please share your findings with us.**

**[Robert Bennett]** Adisseo's research shows that milk yield, content, and composition are altered by heat stress. We recently sponsored a research trial at the University of Illinois to evaluate the effect of feeding Smartamine M on cows under heat stress. Thirty-two multiparous, lactating Holstein cows were randomly assigned to one of two environmental treatment groups and to one of two dietary treatments. Cows were fed a basal diet (CON) or the basal diet with rumen-protected methionine (RPM) in a crossover design. Cows in CON had a greater ( $P = 0.04$ ) decrease in milk protein proportion compared with cows in RPM. In conclusion, heat stress altered physiological and production parameters while RPM aided milk content and composition during heat stress (Pate et al., 2020).

As a follow-up to this research, two abstracts were presented at the 2021 American Dairy Science Association (ADSA) annual meeting (Coleman et al., 2021). One evaluated the RPM impact on liver energy and methionine metabolism. Providing methionine modulated liver protein abundance and enzyme activity, allowing metabolism to remain stable and making cows less susceptible to the metabolic disruptions caused by heat stress.

The second investigated the effects of RPM on the immunometabolic status of the uterus. Abundance of mRNA in inflammatory and metabolic pathways were favourably altered, indicating a beneficial effect of methionine on immune responses and metabolism during the challenging

transition period and early lactation, favouring a uterine environment for successful breeding.

**[Feedinfo] Talking about breeding, we know that heat stress can have transgenerational effects. Is this something that Adisseo has investigated, and how can RPM help mitigate the effects?**

**[Robert Bennett]** When Ouellet et al., (2020), reviewed the impacts of late-gestation heat stress on dam and calf performance, the authors concluded that late-gestation heat stress impairs productivity in the dam and exerts transgenerational effects on progeny. Calves born to heat-stressed dams showed impaired immune function and, therefore, higher disease susceptibility.

Furthermore, Laporta et al., (2020) conducted a study to quantify the carryover effects of maternal exposure to heat stress during late gestation on milk yield, reproductive performance, and survival of daughters and granddaughters. The research included records from nine experiments with data collected over 10 years. The animals were followed for three lactations.

The authors concluded that late-gestation heat stress exerts carryover effects on at least two generations. Maternal late-gestation heat stress negatively affects daughter survival from birth to first calving, length of their productive life, and milk performance. The results suggested that in utero heat stress exerts negative effects on a daughter's longevity and milk production that will persist through three lactations.

Adisseo has conducted research to evaluate how rumen-protected methionine can

mitigate the impact of heat stress. We are continuing this line of research, as there is ample evidence that heat stress can have transgenerational effects.

**[Feedinfo] Addressing heat stress is an immediate response to the effects of climate change. But what about longer-term sustainability challenges facing the dairy industry, like reducing its overall carbon footprint? How important a role can Adisseo's methionine solutions play here?**

**[Robert Bennett]** Supplementing with Smartamine M or MetaSmart, our methionine solution for use in pelleted and liquid feeds, allows the amino acid content of rations to be balanced, i.e., better and more accurately meeting the dairy cow's precise nutrient requirements. This can be used in several ways to benefit the environment.

The first step is to reduce the carbon footprint of the feed or ration due to its ingredient composition. Some feedstuffs will no longer be needed or needed only in smaller quantities because the main essential amino acids for which they were included will be supplied by Smartamine M or MetaSmart. Also, selecting more local feedstuffs lowers the transportation carbon footprint and can help reduce the feed or ration's own carbon footprint due to its composition.

However, the most important impact of amino acid balancing is on the resulting dairy performance and the carbon footprint. Better balanced diets are more efficient. They can be designed to optimise production performance while minimising the carbon footprint and significantly

reducing urinary nitrogen excretion.

Furthermore, balancing amino acid levels has been shown to improve health and reproduction (reduced ketosis and fatty livers in early lactation, better immunity, and lower pregnancy losses, among other effects). These benefits contribute to greater cow longevity, thanks to less culling for poor reproductive performance or health disorders. All of this reduces the milk production carbon footprint, both per cow and per kilogramme of milk produced over her lifetime.

To illustrate, Adisseo's current calculations indicate that the simple addition of Smartamine M or the manual substitution of some ration feedstuffs can lead up to a 10 percent reduction in CO<sub>2</sub> equivalent/kg milk. Further and more thorough optimisation of a full diet can generate up to a 20-30 percent reduction when taking dairy performance into account while also increasing or maintaining profitability. Reductions in CO<sub>2</sub> equivalent/kg of up to 50 percent can be reached, but at the expense of profitability. When looking at a dairy cow's full lifecycle, these figures can be improved by 10 percent, possibly 15 percent, thanks in large part to improved longevity.

**[Feedinfo] You briefly mentioned how balancing amino acid levels can also affect another long-term industry sustainability challenge: nitrogen excretion. This was the subject of a recent study you conducted in France involving Smartamine M. What were some of the findings?**

**[Robert Bennett]** This study analysed the results of a field trial conducted on six farms in western France by INRAE (the

National Research Institute for Agriculture, Food and Environment) and the local Chambers of Agriculture. On average, these farms were able to reduce their ration protein content by 0.5 percent simply by removing half a kilogramme of soybean meal per cow per day and substituting corn and Smartamine M. Not only did this reduce the nitrogen load on the cows and the land, it also increased milk yield and milk protein content.

**[Feedinfo] Relying on locally available protein sources (such as better utilisation of grass and more grazing) has also been suggested to further shrink dairy's carbon footprint and produce more sustainable milk. However, this can result in a fall in milk fat content. You recently launched RumenSmart™ in Europe, which can help with this issue. What has been the feedback from farmers so far?**

**[Robert Bennett]** We have received very positive feedback from dairy farmers in the countries where we launched RumenSmart. RumenSmart has shown benefits in all types of rations. As a result, we are seeing increasing interest from feed companies in more countries. RumenSmart is of exceptional benefit in increasing milk fat in three main situations: Spring grazing (lush grass), summer feeding (butterfat contents are at their annual low due to seasonality) and diets typical of milk fat depression (high starch, low fibre, high oil).

For example, we had very good results during spring grazing in Ireland this year. Farmers maintained their milk fat contents at around 4 percent by using RumenSmart compared with non-users who had milk fat drop below 3.5 percent. This is also

generating much interest in other countries and promoting more grazing for either sustainability or commercial reasons.

In the UK, on diets with large quantities of grass silage, we typically saw increases of 0.2 percent butterfat. We saw similar results in France and Spain where diets tend to be richer in corn and corn silage.

**[Feedinfo] What can the dairy industry expect next from Adisseo?**

**[Robert Bennett]** Adisseo's commitment is clear: contribute to supplying the world with healthy, high-quality, and affordable food based on the principles of sustainability. In conjunction with this, it is committed to bringing dairy top-quality solutions to their needs. Toward this end, Adisseo relies on its 10 research centres and its production sites based in Europe, the USA, and China to design, produce, and market nutritional solutions for sustainable animal feed.

*Published in association with Adisseo.*