SMARTMAIL™ BY ADISSEO

SmartLine™

2021

New Research Highlights the Essential Nutrient Role of Methionine in Dairy

15 Trials Sponsored by Adisseo

As presented at:

ADSA 2020 Virtual Annual Meeting

25 METHIONINE–RELATED ABSTRACTS

MORE THAN **2300** ATTENDEES

59 COUNTRIES REPRESENTED

Research that explores the benefits of amino acid nutrition for ruminants continues to receive significant interest. Some 65 new abstracts related to amino acid and protein nutrition were presented during the American Dairy Science Association (ADSA) virtual annual meeting. Of these, 15 were sponsored by Adisseo. The meeting, reportedly the most comprehensive dairy science meeting in the world, attracted more than 2,300 attendees from 59 countries.

"Methionine is an essential nutrient that fulfills wide-ranging roles in dairy nutrition. Its full impact on production, health, and reproductive performance continues to be explored more fully," said Brian Sloan, Global Director of Ruminant Amino Acids and Protected Nutrient Business, Adisseo. "At the farm level, supplemental methionine offers gains in the production of milk, milk fat, and milk protein. Longerterm, it positively affects health and reproductive performance and the likelihood that an individual cow remains in the herd."

Heat Stress

ILLINOIS

Two presentations from the University of Illinois showed how fully meeting the methionine needs of lactating cows mitigates the impact of heat stress. Additional methionine provides dairy cows with the capacity to modulate mRNA abundance for the synthesis of important proteins, according to their environment, making the cows more resilient to the impact of heat stress.

Milk Production and Composition

Research from the **Federal do Paraná** in Brazil found that high producing cows (>50 kg ECM per day) fed Smartamine® M, a hydrogenated fat source, or both responded with higher energy corrected milk (ECM). Milk fat yield increased with added fat or Smartamine M alone or in combination. Interestingly the addition of both nutrient sources maximized milk protein percent and yield.

Research from the **Cornell University** lab of Dr. Mike Van Amburgh studied the effects of differing dietary starch and digestible amino acid supplies on performance in dairy cows. Results showed that cows fed the diets formulated to be high in starch (29.0 vs 23.0) had higher dry matter intakes. The higher level of amino acids (AA) significantly increased daily ECM by 1 kg and daily milk protein yield by an average of 35g. This was maximized (significant AA X E interaction) with the higher AA associated with the high-starch diet (+50g). Whereas the higher levels of AAs also numerically increased milk fat yields (+35g), the higher starch levels depressed daily milk fat yield by 65g. These results suggest that the best performance will be achieved when optimizing both AA levels and starch levels in the diet without pushing the level of starch to a point it could induce a negative effect on milk fat yield.

At **Penn State**, supplementation of methionine and methionine analogs to diets at risk of causing biohydrogenation induced milk fat depression found that the addition of HMTBa (RumenSmart™), HMBi (MetaSmart®), or a rumen protected methionine (Smartamine M) all resulted in increased milk fat concentrations and yields. The results indicate that more than one mechanism can impact milk fat synthesis. Both providing more metabolizable methionine or the analogue of methionine to the rumen can have a positive effect on milk fat synthesis.

Health and Reproduction

Research at **Cornell University** and the **University of Wisconsin-Madison** found that cows fed Smartamine M for the first 150 days of lactation had a reduced time to pregnancy. Cows with at least one health disorder had a lower risk of being sold before the end of lactation when supplemented with Smartamine M compared to cows fed the basal diet. This improved the chances of an individual cow staying in the herd longer and positively impacting the profitability of the dairy.

Small Ruminants

A total of five studies concerning the AA nutrition of goats were presented. Two research trials were conducted at the Université Paris-Saclay, INRAE, AgroParisTech, UMR Modélisation Systémique Appliquée aux Ruminants. The first found that goats fed Smartamine M with a low-protein diet produced more milk and more milk fat. The previously observed lower protein yield responses were likely a result of underestimating DMI by the INRA 2007 feeding system. Nevertheless, goats fed Smartamine M with a high protein diet had an increased milk protein content.
The second research trial at the Université Paris-Saclay looked at the impact of feeding goats diets with 90%, 100% or 110% of digestible methionine (MetDi) contents. The MetDi was based on the dairy cow requirements of INRA 2007. The research found that the INRA 2007 dietary MetDi recommendation of 2.5% of metabolizable protein can be used for goats whatever their genetic variant for casein-aS1. Feeding 100% MetDi requirements maximized milk protein concentration and yield.

INRAE

l'institut Agro
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AGRO CAMPUS OUEST

INRAE, Agrocampus Ouest conducted three research studies with goats. In the first, supplying methionine from MetaSmart to lactating dairy goats elicited the same response on milk composition as seen in dairy cows. The methionine was provided in a pelleted concentrate. An increase in milk yield and milk fat yield was observed only when an adequate level of dietary energy was provided.

In the second study, MetaSmart supplementation reduced the apoptosis rate at which cells naturally turn over in the mammary tissue by 51%. This cell turnover rate was correlated with milk yield and suggests that MetaSmart increased casein gene expression and reduced cell death. It could partly explain the positive effect of MetaSmart supplementation on milk synthesis in the goat mammary tissue.

In the third study, methionine supplementation increased the activity of the endoplasmic reticulum and promoted the intracellular transport of milk components and, ultimately, their secretion.

PennState

Product Evaluations

Four research trials provided more product evaluation insights. Work at the **University of New Hampshire** demonstrated that the plasma AA dose response method is the most effective methodology to detect differences in the methionine bioavailability of rumen-protected supplements. In a comparison of doseresponse slopes using total sulphur amino acids (TSAA) expressed as a percentage of total amino acid (TAA)-TSAA , it showed that AminoShure- XM, MetiPEARL, and Timet were 35.0%, 9.3%, and 24.0% as effective, respectively, as Smartamine® M in providing metabolizable methionine.

A second study at the **University of New Hampshire** used the plasma free-aminoacid dose-response method to validate the bioavailability of methionine and lysine in Smartamine® ML. It compared the effectiveness of two commercial products (AjiPro-L 3G and Smartamine ML) vs abomasally infused lysine in providing metabolizable lysine. The results showed AjiPro-L 3G was 46.7% (± 4.8) and Smartamine ML was 80.4% (± 4.8) as effective, as abomasally infused lysine.

This study also showed the methionine in Smartamine M was 83.5% (± 5.0) and in Smartamine ML was 81.3% (± 3.3) as effective as abomasally infused methionine, in providing metabolizable methionine.

CERN

Adisseo Centre of Expertise and Research in Nutrition

A meta-analyses was conducted at the **Adisseo Centre of Expertise and Research in Nutrition** (CERN) in France using a database of peer reviewed publications where Smartamine M or MetaSmart were used as the supplementary sources of rumen protected methionine (RPM). The results showed that the responses of lactating dairy cows can be predicted as a function of RPM . The milk protein content and yield varied according to the lactation period and could be modulated by other factors in the diet.

WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

SHIMADZU
Excellence in Science

The **University of Wisconsin-Madison** in conjunction with **Shimadzu Scientific Instruments Inc.** compared an underivatized method to quantify bovine plasma amino acids via liquid chromatography electrospray mass spectrometry with a derivatized method. They found that derivatization had greater sensitivity, linearity, and recovery rates. It is preferable to use the derivatized methodology to accurately measure all the essential and non-essential amino acids, as certain nonessential amino acids could not accurately be determined by the underivatized method.

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