Industry Perspectives Video: Supporting Dairy Cows Through Improved Methionine Supplementation

Host	***Morné Brandt**, Head of Feedinfo Perspectives Content*
Guests	***Lukas Bauer**, Technical Support Manager Ruminants, Evonik*
	***Jessie Guyader**, Ruminant R&D Manager, Evonik*
Length	*16min 43sec*

Morné Brandt (0:04)

Hi there and welcome to this Feedinfo video on supporting dairy cows through improved methionine supplementation.

My name is Morné Brandt, and I am the Perspectives Content Editor here at Feedinfo.

This video, which we have put together with support from Evonik, will dig into the important role that methionine plays in supporting dairy cow productivity, health and reproduction, especially during the crucial transition phase.

So, to help us explore this a bit more, I have with me today Global Technical Support Manager, Lukas Bauer and Ruminant R&D Manager, Jessie Guyader, both from Evonik.

Thank you, guys, for joining me today. I wonder if we could just kick things off with you both telling us a bit more about yourselves and your roles at Evonik. Jessie, let's start with you. Please tell us a bit more about yourself.

Jessie Guyader (0:58)

Hi everyone. My name is Jessie Guyader, and I am the Ruminant Research Manager at Evonik for almost two years. I am based in Germany near Frankfurt. I have almost nine years of experience in ruminant nutrition, which encompass a PHD and a postdoc in rumen fermentation, and also three of experience in the research group of an international feed company.

My current role consists in first developing the scientific knowledge on our products in terms of functions and metabolic roles at different stages of lactation. And I'm also in charge of testing our products globally, in different farm management conditions, with a specific focus on performance, health and sustainability of the production systems.

Morné Brandt (1:45)

Fantastic. So just the person to help us explore this topic in a bit more depth today. Now, Lukas, can I come to you? Can you please tell us a bit more about yourself?

Lukas Bauer (1:57)

Hi, my name is Lukas Bauer. I'm the Technical Support Manager for our sustainable ruminant solution products. I work together with our team of regional experts across the globe and we provide detailed information and guidance to customers who are interested, and really focused on profitable and sustainable dairy farming. I've been working for Evonik for five years now and since my studies in agricultural science, I have been involved in the animal nutrition industry.

Morné Brandt (2:33)

So, equally well placed for our discussion today and the perfect person to give us a bit more background on this topic. So, Lukas, can you tell us why methionine supplementation is so crucial for dairy producers to consider.

Lukas Bauer (2:48)

So, methionine in a dairy cow's diet is a very important part, because it's usually the amino acid that limits milk production and milk protein synthesis the most. The reason for that is that methionine concentration in microbial protein is much lower than in the milk protein. So, you see that there is a gap. Additionally, methionine is a functional amino acid and that means it plays an important part also in the metabolism. So, it has several functions going into the health and also the development of the animal.

Morné Brandt (3:28)

So, clearly an essential nutrient for dairy producers to be thinking about. But I wonder Lukas, are dairy producers always getting methionine supplementation, right? What is the main challenge here for them?

Lukas Bauer (3:42)

When using supplemental amino acids in the dairy cow's diet, for example rumen-protected methionine, it is important that that amino acid is protected against microbial degradation, this is the first thing.

Then the second thing is that also this amino acid has to be released out of the product in the small intestine, so it can be absorbed and then used in the metabolism of the dairy cow.

The third thing is that the product has a physical stability when using the product, for example, in the feed mill feed mixing, but also in the TMR mixing on the farm.

And then, in the end of course, having chosen the right product, it is important that the nutritionist has a programme at his hand where he can evaluate the amino acid supply from the ration but also the amino acid requirement of the specific herd and bringing all this together in the right way to supplement amino acids in a dairy cow's diet.

Morné Brandt (4:49)

Now Jessie, Lukas just talked about methionine's importance in milk production. But I just want to zoom out a bit and talk about a dairy cow's reproductive performance, which obviously plays a big part in the milk production process, and the fact that the transition period is of particular importance here. So, can you tell us why that is?

Jessie Guyader (5:13)

The transition period of a cow is defined as the three weeks before calving and the three weeks post calving. It's a period of a lot of change.

First, the cow needs to adapt to a different diet. She was usually fed a very fibrous diet during the dry-off period and now she has to be adapted to a diet richer in starch. It's also a period where the requirements of the animals are increasing a lot to support the increase in milk production, the milk yield and the milk protein.

But it's a period where the animal still has a low intake because the rumen is not fully functional. So, this imbalance between the high requirement and low intake creates a status that we call the "negative energy balance". To compensate for that the cow has to mobilize her body fat. The fat will be exported from the tissue to her liver as non-esterified fatty acids (NEFA).

This has two consequences. The first one is that the NEFA support the low intake of a cow, which will further support the negative energy balance. On the other hand, this massive arrival of fat in the liver will provoke what we call the fatty liver, and then will further alter the liver functions. And we know that the liver is really important for a lot of different functions such as protein synthesis or the immunity. The liver to give more energy to the cow, we transform the fat into ketone bodies, the most important one is the beta hydroxybutyrate. And this increase in the plasma concentration of ketone bodies will further lead to a metabolic disease called ketosis. Even though the ketone bodies can partially fulfil the energetic requirements of an animal, they have deleterious effects on the animals, because they can lead to more inflammation issues.

Morné Brandt (7:21)

Thank you for that, Jessie. Now that we know a bit more about the transition period, let's circle back to methionine and talk about how rumen-protected methionine can be of use during this critical time in the dairy cow's life, and exactly how supplementation can lead to improvements. So, Lukas, can I come to you and ask you to kick us off here, please?

Lukas Bauer (7:44)

Okay, let's start with the amino acid balancing concept in general. For most of you, it's known that if we balance the diet for amino acids, we can reduce the expensive protein in the dairy diet. And this means production costs can be decreased and profitability can be increased. So, this means that nitrogen efficiency with supplemental methionine can be increased. And there is a nice illustration for that, the Liebig barrel that you all know.

So, it shows that on one side, we can either increase all the protein sources, but this will be quite inefficient to increase the milk protein production or the milk production in general. Or we just supplement the limiting amino acids in a very specific amount to balance the diet.

And this has a nice impact on the nitrogen efficiency, as I mentioned already, and we also have a nice trial example for that concept. And this is the Broderick trial published in the Journal of Dairy Science. In this trial, the crude protein level was reduced from 18.6% to 14.8%, and together with that, rumen-protected methionine in the form of Mepron, was added in different steps. So, the lowest crude protein level had the highest amount of Mepron in the ration. And in this trial, or in the trial results, we can see that the milk nitrogen efficiency went up from the highest crude protein level to the lowest crude protein level. I mean, this is not really specific for this trial. But what we have seen here in this trial is that in the intermediate treatments, the milk protein, and also the milk production were the highest compared to the other two treatments. And, additionally, the nitrogen excretion was also measured. And this showed that there is a big advantage if you use Mepron and the crude protein amino acid balancing concept in your diet.

Morné Brandt (10:21)

And now, Jessie, what can you add for us here?

Jessie Guyader (10:24)

So now let's focus on the transition period and the effect of rumen-protected methionine on transition cows. So, to assess this effect Evonik conducted a trial at the University of Illinois in which two groups of 30 cows were fed either a controlled diet or a diet supplemented with Mepron.

So, the supplementation period covered the transition period and continued until 60 days in milk. So, overall, we had 60 multiparous cows, which were fed once per day and milked three times per day.

What were the most important results?

We observed greater performance with additional rumen-protected methionine. So, this is illustrated here, where you can see the graph related to energy correcting milk, so the ECM, over milk yield. And the Mepron curve is the white triangle and you can see that the milk production was higher right at the beginning of lactation and was continuously higher until the 60 days in milk.

How did we achieve these results?

The cow had less ketosis, and this was observed by the lower concentration in the plasma of non-esterified fatty acids and beta hydroxybutyrate as observed in these two graphs. So, overall, that means that the liver functions were improved, and this was also observed when we looked at plasma biomarkers related to inflammation or oxidative stress. Mepron, or methionine supplementation, reduces inflammation and also reduces oxidative stress.

So, overall methionine works in the metabolism by improving liver health and immune functions and helps protect the animals against oxidative stress. So, overall, the cow is in a better condition and through that performs better. In companion papers we also observed that rumen-protected methionine and Mepron improved the health and the functions in the mammary gland.

Lukas Bauer (12:48)

So now we look to the Mepron product itself. So, Mepron works by providing methionine in a highly bioavailable form for the cow. And this can be achieved by the unique ethyl-cellulose protective layer that Mepron has. The film coating with ethyl-cellulose works with a time-dependent release technique, so that means with more time the product stays in the animal, the higher the methionine release from the product is. And this is really mimicking the methionine release from other protein sources. Therefore, the methionine can be very efficiently absorbed and used in the metabolism.

Morné Brandt (13:42)

Thank you both for that. Now, Jessie, we've just heard how methionine supplementation can benefit the dairy cow in a number of ways. But what about her offspring? Are the effects of increased methionine supply limited to the mother only? What are you seeing in calves?

Jessie Guyader (14:03)

The effect of increased methionine supply is not only limited to the mother. If we go back to the Illinois study, we can have a look at the performance of the calves that were born from the cows that were fed either controlled or Mepron.

We observed the performance from calving to weaning and we observed that the calves that were born from cows fed Mepron had higher growth performance. So overall in this table you can observe the higher body weight on average during this pre-weaning period for calves coming from Mepron cows and also an improved frame of the animals. This is of utmost importance because recent studies observed a positive relationship between the average daily gain during pre-weaning of a heifer and her performance during the first lactation.

How did we achieve these results?

So, these calves, when they were born, samples were taken of the placentum and also there were liver biopsies taken during the pre-weaning period. And on these two sets of samples, we measured several indicators related to the overall metabolism. And what we observed is that they were an enhanced activity of several parameters that triggered higher protein synthesis, and also higher energy metabolism and lower oxidative stress. And this was observed on both the placentum, so at birth, and also during the pre-weaning stage.

So, overall, methionine triggered a kind of epigenetic effect, which is a very interesting new area of research. And, overall, this epigenetic effect supported the higher growth performance of the cows before weaning.

Morné Brandt (15:58)

Thank you, Jessie, for that great overview. And thank you to you too Lukas. Thank you to you both for sharing your expertise with us today on the importance of methionine in the overall health, wellbeing and productivity of the dairy cow and, especially, during the transition phase that is so important to the milk production process.

And thank you to everyone for tuning in. We hope you can join us again for future videos from Feedinfo. And remember to keep up to date with the latest developments on this and more topics affecting the dairy industry, do join us on feedinfo.com

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