



The Rewards of AA Balancing and Ration Formulation

Production | Health | Reproduction

Methyl Donors from Transition to Lactation

Dr. Jose Santos, Animal Science, University of Florida

Answers to Questions Asked



Answers Courtesy of:

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Q: With the Arshad trial, was the digestible (metabolizable) methionine level in the ration a deficiency or adequate?

A: The Arshad study was a meta-analysis. Levels of metabolizable methionine in the trials retained for the meta-analysis ranged from 1.65% to 2.65%.

Q: In the Arshad analysis, slide 25, it appeared that when the digestible methionine in the intestine (MetDI) content is high the distribution of choline reduces milk production?

A: It is important to properly interpret this figure, in particular, the interaction.

The purpose **WAS NOT** to analyze the associations between methionine (MET) and cow responses among different experiments, but to analyze the **interaction** between supplemental choline and the supply of metabolizable MET within and between experiments, i.e. does the response to rumen-protected choline change with level of dietary MET as % of MP in postpartum diets?

What the data shows is that the response to choline was greater in diets with less metabolizable methionine as % of MP, whereas the response was smaller when cows were fed diets with very high metabolizable methionine as % of MP (2.5% to 2.7% of the MP).

It is unquestionable that in diets with limiting quantities of methionine, supplying additional rumen-protected methionine to balance for amino acids will increase milk protein content and yields of milk and milk protein. The production, metabolic health, and generational benefits of enhancing methionine levels in dairy rations will be detailed in the third webinar of the series presented by Dr. Johan Osorio, Dairy and Food Science, South Dakota State University.

Q: Is the Arshad study realistic? Is cutting NEL 7 Mcal pre-calving something that we typically see?

A: The objective of this trial was to investigate, in a challenged state of excessive mobilization of body fat, how certain biomarkers of metabolic health reacted to variable choline doses and concentrations provided by a protected choline product. Liver triacylglycerols (TAGs) decreased but liver glycogens increased with increasing doses of choline.

Q: The no interaction between rumen protected choline (RPC) supplementation and the body condition score (BCS) for milk yield response, does it not surprise you?

A: Yes. One would have anticipated the less conditioned animals to be less predisposed



to health problems and to have less need for choline supplementation. This dataset challenges this dogma.

Q: Do you consider it interesting, the use of choline just in prepartum? From a practical point of view, it's not very easy applying feed additives to fresh cows.

A: If from a practical point of view, supplementation of a methyl donor is only possible prepartum, this is still worthwhile. This will help dry matter intake pre and postpartum and metabolic health around calving.

Q: What would be the effect of feeding betaine to transition cows on liver TAG accumulation and fresh cow production compared with choline?

A: Similar to choline, betaine is degraded in the rumen. It would need to be protected to potentially have an effect on TAG accumulation.

Q: Can RPC be removed abruptly postpartum?

A: Yes, but likely with diminished benefits.

Q: If I feed the correct or even above an adequate amount of methionine, will it be cost effective to feed choline? Will it be cost effective under any condition?

A: The benefit to feeding choline when MET requirements are covered should be evaluated on a case-by-case basis. Choline probably should be kept in the transition cow ration until the cows in a herd entering the far-off pen are not over-conditioned.

Q: Thinking on cost benefit in a commercial dairy farm, could it be more interesting to feed choline prepartum, and MET postpartum? The research with MET has showed more milk and milk components compared with choline trials.

A: This is a solution worth considering. Methionine is certainly needed in rations as a building block to meet milk protein synthesis requirements. Methionine is also important for the synthesis of all the enzymes critical for metabolic processes and efficient lactation performance. Nevertheless even pre-partum it may be less expensive to rely on MET as the major methyl donor, as it can be used to provide phosphatidyl choline as well as the methionine critical for the synthesis of the ApoProteins. Both are necessary for the synthesis of the very low density lipoprotein (VLDL) complex critical for evacuating triglycerides from the liver.



Q: The response of the administration of the protected choline is maintained for up to 40 weeks of lactation when administrated from prepartum or just beginning in the early lactation?

A: At this stage, it would be pure speculation. There is no research available to answer this question. Until the contrary is shown, it should be assumed the methyl donor needs to be fed in both the prepartum and postpartum phases of the transition period to obtain positive residual effects on lactation performance.

Q: What is the interaction between the amount of neutral detergent fiber (NDF) and the amount of methionine synthesis of metabolizable protein (MP) in the rumen?

A: NDF and more importantly digestible NDF is one of the key sources of organic matter necessary for microbial protein synthesis, along with starch and sugars. The additional advantage of adequate NDF is on rumen health because the products of fermentation keep the rumen within the correct pH range for optimum function. Maximizing microbial protein synthesis should always be the first objective in any nutritional strategy to maximize methionine supply to the dairy cow.

Q: What recommendations for inclusions of B12, B9, and choline would you have? Rules of thumb, per se.

A: For those interested, I would consult the work of Christiane Girard, Lennoxville, Canada, on B Vitamin Needs. Unfortunately, both synthetic B9 and B12 are destroyed in the rumen and need to be protected to have a chance of being effective.

Q: What about the ratio of methionine to lysine and what effect would it have on the absorption of choline?

A: As far as I know, choline does not compete with lysine or methionine for absorption sites in the small intestine.

Q: Are there any studies comparing rumen protected (RP) MET to RP choline pre/postpartum supplementation on methyl donor contribution?

A: Yes. There are three published 2*2 factorial studies studying adding choline or methionine alone or in combination:

Zhou et al., 2016. Rumen-protected methionine compared with rumen-protected choline improves immuno-metabolic status in dairy cows during the peripartal period.

J. Dairy Sci. 99:8956-8969.



Ardalan et al., 2010. Milk yield persistency and its relationship with health problems in Holstein dairy cows supplemented with different levels of ruminally protected methionine and choline.

Archiv Tierzucht 53, 266-276.

Potts et al., 2020. Production responses to rumen-protected choline and methionine supplemented during the periparturient period differ for primi- and multiparous cows.

J. Dairy Sci. 103 In Press.

The Zhou study showed limited effects of choline irrespective of no or added methionine. Whereas the MET effect was very significant on both production parameters +4kg energy corrected milk (ECM), +180g of milk protein, +0.18% in milk protein concentration.

The Ardalan study indicated both MET and choline had positive effects, independent of the presence of the other, on decreasing the occurrence of metabolic diseases. The combination of both resulted in no recorded incidences of commonly measured calving difficulties and metabolic diseases around parturition. Both methionine and choline independently increased ECM and the combination increased ECM by 4.5 kgs.

In the Potts study, it was less clear whether the choline and methionine responses were independent, but this study has a lack of cow numbers so results should be interpreted with caution. Nevertheless, at least for the multiparous cows, the main effect of methionine showed a daily increase in milk protein of 50 grams and 140 grams of milk fat.

The answers to the questions are provided in good faith and are the scientific opinions uniquely of Dr. Brian Sloan, Adisseo.

