Effect of MFP® Feed Supplement* on Improving Milk Fat Yield

Background

A multi-trial analysis of methionine sources fed to dairy cows (Zanton et al., 2014) found that HMTBa in either dry or liquid form increased ($P<0.05$) both milk protein and milk fat yields compared to unsupplemented control diets. While the milk protein response was not statistically different ($P>0.10$) between HMTBa, coated methionine sources or post-ruminally infused methionine, the milk fat response to feeding HMTBa was significantly greater ($P<0.05$) than the other methionine sources.

These findings sparked further interest in the rumen effects of HMTBa, especially with regards to milk fat production. Researchers at Penn State University hypothesized that HMTBa could be affecting rumen lipid metabolism, specifically the biohydrogenation of unsaturated fatty acids, which are fed in significant quantities to dairy cows in corn, corn silage, soybeans, distiller grains and other byproduct feeds that could lead to diet-induced milk fat depression (MFD).

Methods and Results

Penn State researchers developed an MFD challenge model where cows are fed a series of three diets formulated to be low, medium and high risk for diet-induced MFD. The risk of diet-induced MFD is increased by reductions in fiber and addition of vegetable (soy) oil to the diet. This increases the likelihood of alterations in the rumen biohydrogenation of unsaturated fatty acids leading to production of specific, milk fat depressing fatty acids. Treatments are then superimposed on this diet progression. For example, an unsupplemented control group could be compared to a group of cows supplemented with HMTBa to determine whether the treatment had any benefit in maintaining milk fat yield in the face of increasing risk of diet-induced MFD.

In the first study (Baldin et al., 2018), 16 high producing (97 pounds milk, 166 days in milk) and 14 low producing (69 pounds milk, 267 days in milk) cows were fed a series of diets with increasing risk of MFD over 70 days.

*MFP® Feed Supplement is a dry methionine source containing the naturally occurring precursor of L-methionine, HMTBa.

MFP®
FEED SUPPLEMENT

Trial Report Summary

Key Findings

- Feeding 30 grams of MFP® per cow per day (HMTBa at 0.1% of diet dry matter) to cows fed diets with a high risk for diet-induced MFD increased milk fat yield by 0.5 pound (227 grams) per day, a 23% increase, and milk fat percentage by 0.5% compared to control.
- Feeding 30 grams of MFP® per cow per day to cows fed diets with medium risk for MFD increased milk fat yield by 0.26 pound (120 grams) per day, an 8.8% increase, compared to control and milk fat percentage by 0.25%.
- High producing cows are more at risk for MFD and will respond to HMTBa supplementation more than low producing cows.

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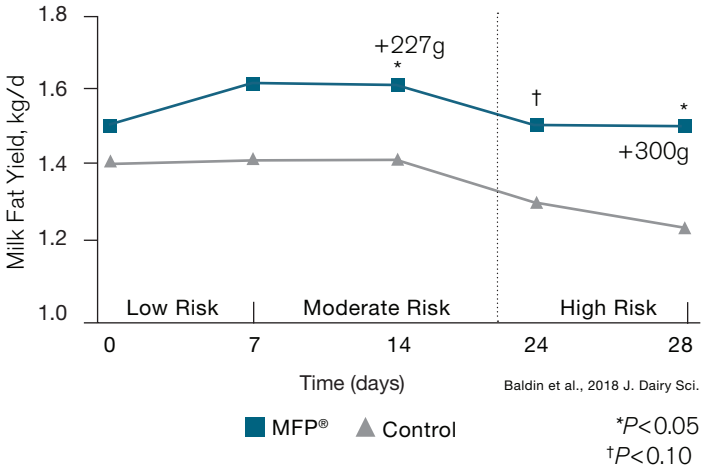
Half of the cows in each production group were used as control, and the other half were fed HMTBa at 0.1% of diet dry matter. High producing cows fed HMTBa produced an additional 0.5 pound (227 grams) of milk fat ($P<0.04$) during the high-risk diet phase compared to control cows (Figure 1). This was a 23% increase in milk fat yield. In addition, feeding HMTBa prevented the increase in milk *trans*-10 C:18 fatty acid that occurred in control cows. This fatty acid is a specific marker of altered rumen biohydrogenation pathways that lead to diet-induced MFD. The authors concluded that "feeding HMTBa helps stabilize rumen biohydrogenation pathways and prevent the shift towards production of milk fat depressing fatty acids in the rumen."

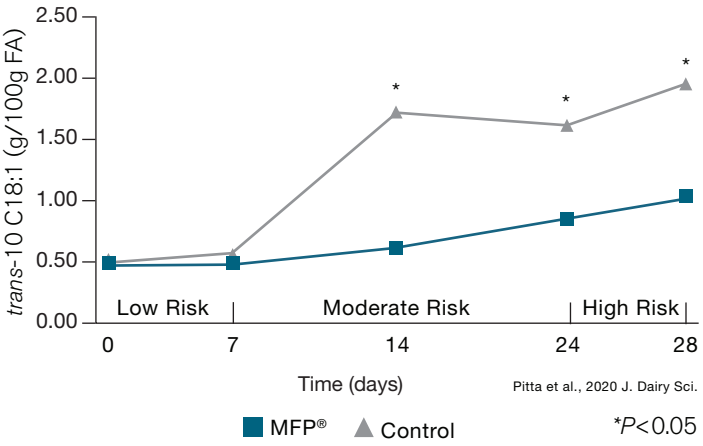
FIGURE 1. Impact of HMTBa Supplementation on Milk Fat Yield in Cows Fed Diets Moderate Risk for MFD



A second study (Baldin et al., 2019) by the same researchers studied 12 first-lactation (72 pounds milk, 112 days in milk) and 24 multi-lactation cows (100 pounds milk, 106 days in milk) in a protocol where low and moderate risk diets were fed with or without 0.1% HMTBa over an 80-day trial period. Cows fed HMTBa, in combination with the moderate MFD risk diet, produced 0.26 pound (120 grams) more milk fat ($P<0.05$) than control cows, an 8.8% increase. Like the first study, the level of milk *trans*-10 C:18:1 fatty acid was significantly ($P<0.05$) lower in cows supplemented with HMTBa.

Finally, the Penn State (Pitta et al., 2020) research group conducted a third study in conjunction with the University of Pennsylvania aimed at tracking the diversity of rumen microbial populations under the MFD producing protocol and the response to feeding HMTBa. In this study, 22 high producing cows were fed a 3-diet series of low, medium and high risk for MFD, with or without 0.1% HMTBa, over 28 days. As in the prior 2 studies, feeding HMTBa resulted in higher milk fat yield and reduced levels of milk *trans*-10 C:18:1 fatty acid (Figure 2). Importantly, feeding HMTBa under conditions of moderate and high risk of diet-induced MFD maintained the diversity of the rumen microbial population and prevented the growth of 3 specific genera of bacteria that were associated with feeding milk fat depressing diets. Feeding HMTBa also prevented the accumulation of *trans*-10 C:18:1 fatty acid in milk.

FIGURE 2. Effect of Feeding HMTBa on Milk Trans-10 C:18:1 Fatty Acid on Low, Medium and High Risk Diets for MFD



All diets fed in the studies were similar in nutrient composition to diets fed on commercial dairy farms, however, the medium risk diet for MFD was most equivalent to a common commercial diet found in the United States.

Conclusions

These 3 studies confirmed the unique effect of feeding HMTBa on milk fat yield in dairy cows reported in an earlier meta-analysis (Zanton et al., 2014). They also established that the effect of HMTBa is related specifically to function of the rumen biohydrogenation pathways, the accumulation of associated fatty acids in milk and the growth of specific rumen bacterial genera. Based on the responses from more recent studies at Penn State, feeding HMTBa at 0.1% of diet dry matter will increase milk fat yield by 0.3 to 0.5 pound (135-227 grams) of milk fat per day in cows fed diets with moderate to high risk of MFD. High producing cows are more at risk for MFD and will respond to HMTBa supplementation more than low producing cows. The response was observed across lactation number.

References

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