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SMART REPORT
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Feeding rumen-protected methionine during the peripartum period improved milk fat content and reduced the culling rate of Holstein cows in a commercial herd

HIGHLIGHTS

Methionine supplementation during the peripartum period improved milk fat content and those cows had a lower culling rate at 60 DIM than Control cows.

OBJECTIVES

The objective of this study was to evaluate the effects of rumen-protected methionine (RPM) supplementation on the productive performance and metabolic aspects of transition dairy cows in a commercial herd.

EXPERIMENTAL DESIGN AND MEASURES

A total of 166 Holstein cows were used for analysis, with 108 multiparous and 58 nulliparous cows. Treatments were as follows: Control (control diet without RPM) and RPMet (diet with RPM, Smartamine® M) including 8 g per animal daily prepartum and 15 g per animal daily postpartum. This provided 4.8 g and 9 g of additionally metabolizable methionine pre- and postpartum, respectively. The reason for using two different doses was to maintain a 2.8:1 Lysine:methionine ratio and treatments were top-dressed daily at the morning feeding. Cows were head locked for 30 min to ensure intake of the treatments, and it the treatment was not consumed during that time it was administered orally as a bolus. Treatments began when animals were moved to the close-up pen and were fed until 16 d postpartum. After leaving the fresh pens and moving to high-producing groups, all animals were supplemented with RPM (15 g per animal daily).

Body weight and body condition score (BCS) were measured at -7 d prepartum and +7 d postpartum. Colostrum quality was measured using a Brix refractometer. Milk yields were collected daily through 90 DIM. Milk samples were collected once a week during the first 2 weeks of lactation for milk composition analysis. Blood samples were collected just before the morning feeding on days -14, -7, +1, +14, and +30 relative to calving date for plasma biomarkers of metabolism

and liver functionality index (LFI) calculation. Blood samples from 30 animals per treatment on -7, +7, and +14 d relative to calving were used to measure plasma amino acids (AA). During the first 60 d postpartum, the incidence of diseases was recorded. Morbidity was assessed by the presence of one or 2 or more diseases. Reproductive parameters evaluated were pregnancy rate, pregnancy at 60, 120, and 150 d, confirmed by rectal palpation using ultrasound, and the number of inseminations per conception.

RESULTS

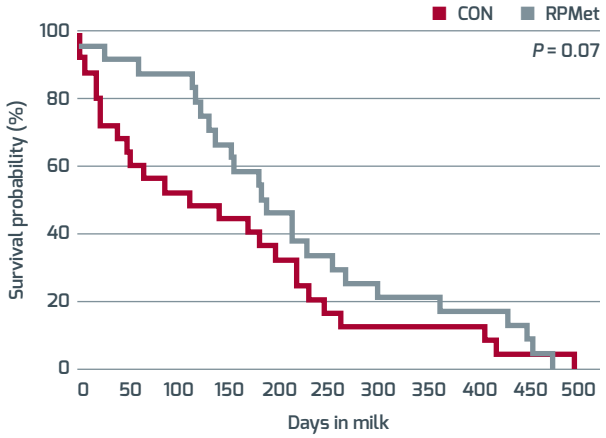
Milk yield was greater for RPMet cows during the first 16 DIM than Control cows. However, milk yields were not different after 16 DIM when all cows began receiving dietary RPMet. Milk fat content was also greater in RPMet cows during the first 2 weeks of lactation, but total protein content was not different between Control and RPMet cows. Yields of milk fat, protein, energy-corrected milk, lactose content, casein, fat/protein ratio, MUN and colostrum brix also did not differ between treatments.

Table 1. Milk production parameters

Parameter	Control	RPMet	SEM	*P*-value
Milk yield 16 d (kg/d)	30.37	31.76	1.04	0.02
Milk yield 30 d (kg/d)	35.65	36.14	0.99	0.54
Milk yield 60 d (kg/d)	43.10	42.90	1.14	0.87
ECM (kg/d)	38.01	39.72	1.32	0.35
Fat (%)	4.10	4.45	0.11	0.02
Total Protein (%)	3.39	3.47	0.04	0.24
Fat (kg/d)	1.19	1.22	0.07	0.83
Total Protein (kg/d)	0.90	0.94	0.06	0.59
Fat/protein ratio	1.18	1.24	0.03	0.23
Lactose (%)	4.43	4.46	0.04	0.71
Casein (%)	2.66	2.74	0.04	0.18
Casein/protein ratio	0.78	0.79	0.02	0.46
Total solids (%)	13.63	13.67	0.16	0.82
MUN (mg/dL)	12.86	13.61	0.54	0.29
SCC	3.60	4.10	0.22	0.08
Colostrum (% Brix)	25.6	26.4	0.48	0.27

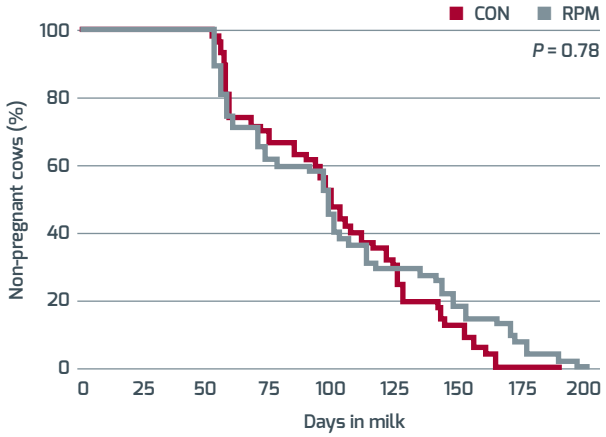
Body weight, BCS, LFI, reproductive performance and health event incidence were not different between treatments. Culling rates at 60 DIM were lower for RPMet cows than Control cows. When assessing the culling distribution of these animals, it is observed that they occur mostly in the first 150 DIM for Control animals and in the second half of lactation for RPMet animals.

Figure 1. Survival probability of culling animals supplemented or not with RPMet



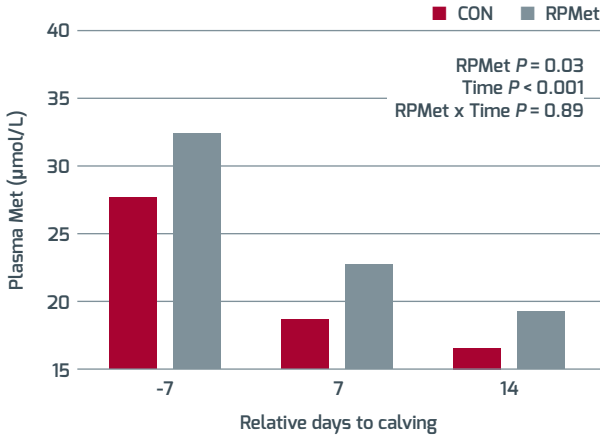
Control: Basal diet; RPMet: Basal diet including 8 g per animal daily in the prepartum and 15 g per animal daily in the postpartum period of Smartamine® M (Adisseo Inc., Antony, France), which provides 4.8 g (prepartum) and 9 g (postpartum) per animal daily of additional metabolizable Met.

Figure 2. Survival probability of pregnancy of animals supplemented or not with RPMet



Control: Basal diet; RPMet: Basal diet including g per animal daily in the prepartum and 15 g per animal daily in the postpartum period of Smartamine® M (Adisseo Inc., Antony, France), which provides 4.8 g (prepartum) and 9 g (postpartum) per animal daily of additional metabolizable Met.

Figure 3. Plasma Met levels of cows supplemented or not with RPM during transition



Control: Basal diet; RPMet: Basal diet including 8 g per animal daily in the prepartum and 15 g per animal daily in the postpartum period of Smartamine® M (Adisseo Inc., Antony, France), which provides 4.8 g (prepartum) and 9 g (postpartum) per animal daily of additional metabolizable Met. Blood samples was collected -7, +7 and +14 d relative to calving from 60 animals (Control: total 30 animals, 20 parous and 10 nulliparous; RPMet: total 30 animals, 20 parous and 10 nulliparous).

There were no differences in the measured blood metabolites between treatments. All plasma AA concentrations were similar between treatments, except for methionine, which was greater in RPMet cows than Control cows.

DISCUSSION

Methionine supplementation in the present study increased milk fat content and numerically increased milk protein content, which is likely linked with the known role that methionine plays in activating mechanistic target of rapamycin (mTOR; a metabolic regulator of protein and fat synthesis).

It is surprising that no plasma metabolites and LFI were not different between treatments. However, one factor for that may be that all animals received a diet with RPM after 16 DIM. Additionally, metabolites were within normal ranges and the NEFA/cholesterol ratio indicated that cows were at lower risk of developing diseases, indicating good health in the herd.

The decrease in culling is in accordance with previous work published by Toledo et al., (2023), and may be linked to the DMI improvement, immune responses and antioxidant responses that have been previously reported to improve when RPM is supplemented to transition cows.

In contrast to previous work, there was no impact of RPM on reproduction. This may be related to the low disease incidence, as well as the fact that all cows received methionine after 16 DIM.

CONCLUSION

Rumen-protected methionine supplementation was effective in delivering post-ruminal methionine, as demonstrated by the greater plasma methionine concentrations in RPMet cows compared to Control cows. Supplementation of RPM during the transition period had positive effects on production with increased milk yield in the first 16 DIM and milk fat content, but not milk protein or casein content. Although blood metabolites and morbidity were similar between treatments, culling rate from calving until 60 DIM was lower in RPMet cows than Control cows, indicating an improvement in herd longevity and performance with methionine supplementation.

REFERENCE

Leão, G.F., S.K. Santos, E.J. Askel, T.C.A. Michelotti, G. Negro, F. Lopes, D. Luchini, F.C. Cardoso, and R. Almeida. 2024. Feeding rumen-protected methionine during the peripartum period improved milk fat content and reduced the culling rate of Holstein cows in a commercial herd. J. Dairy Sci. 107(9):6758-6770.

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