Choline and methionine are commercially available in forms that protect them from ruminal degradation. Based on knowledge from the non-ruminant literature, methionine, like choline, is lipotropic. That means they both facilitate transport of fat out of the liver. This information has led some nutrition advisors to suggest that rumen-protected choline (RPC) does not have to be fed to transition cows if rumen-protected methionine (RPM) is fed.

Choline in PC can come from the diet, or if there is not sufficient dietary choline, cows can synthesize PC endogenously (Figure 1). In dairy cows, there is sufficient endogenous synthesis except during the transition period when fatty acid mobilization from adipose tissue is great, fatty acid uptake by the liver increases dramatically, and fat accumulates in the liver. Endogenous synthesis of PC occurs by methylation of phosphatidylethanolamine (Figure 1). The methyl groups for this can be derived from methionine. Hence, the close metabolic relationship of the two compounds and the observation in non-ruminants that methionine can spare choline and choline can spare methionine.

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There are several lines of evidence that does not support feeding RPM in lieu of RPC. First, even in non-ruminants, choline and methionine can’t completely spare each other. They both have unique biological roles that cannot be satisfied by the other. Secondly, there have been six trials that have examined the ability of RPM or methionine analogs to reduce liver fat during the transition period (five studies; Osorio et al., 2013; Piepenbrink et al., 2004; Preynat et al., 2010; Socha, 1994; Zhou et al., 2016) or during energy restriction induced fat mobilization (one study; Berts et al., 1999). None observed an effect of methionine to reduce liver fat. Third, the University of Florida summarized (Staples, unpublished) six studies in which RPC was supplemented to diets that were balanced for metabolizable methionine. All six studies reported milk production responses (Figure 2) that were consistent with a meta-analysis of 13 transition cow studies (Grummer, 2012) and the average response was 5.2 lbs of milk per day. Clearly, a milk production response occurs even if methionine is supplemented. Finally, using a liver cell culture system, research from the University of Wisconsin (Chandler et al., 2017) demonstrated choline, but not methionine, was able to stimulate VLDL export.

There is absolutely no evidence to suggest that feeding RPM to transition cows eliminates the need to feed RPC. The recommendation by some nutritional advisors to do so is based on non-ruminant research indicating a lipotropic effect of methionine that has not been demonstrated in ruminants. The reason methionine has not been able to replicate the effects of choline in transition cows is not known. It may be that there are differences between ruminants and non-ruminants in methyl metabolism. Alternatively, it may take higher doses of methionine to obtain a choline sparing effect. However, one should not attempt to simply feed more RPM to achieve this effect as feeding excess methionine can depress feed intake and possibly become toxic to the cow (Richard Erdman, personal communication/unpublished).

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