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Got milk fat depression? Get solutions.

Milk fat depression (MFD) has plagued dairy herds for years, and has become an emerging problem with the increased availability of dry distillers grains (DDG). As a result, we now have a better understanding of MFD.

The biohydrogenation (BH) theory appears to address the many dimensions of MFD. Scientists[1] demonstrated that certain dietary conditions alter rumen BH pathways, producing unique fatty acid intermediates that inhibit milk fat synthesis. Their work shows that *trans*-10, *cis*-12 conjugated linoleic acid (CLA), produced by ruminal BH of the polyunsaturated fatty acids (PUFA), is inhibitory in very minute quantities: As little as 3 grams formed daily in the rumen are sufficient to reduce milk fat by 25 percent or more.

MFD requires 1) altered rumen fermentation and 2) presence of PUFA in the rumen.[5] When developing nutritional strategies to minimize effects on milk fat production, consider the following risk factors:

Altered Rumen Fermentation:

- Low rumen pH
- Small feed particle size
- Low physically effective fiber
- High starch (NSC)
- Rumensin®
- Feeding pattern

Supply of PUFA:

- Amount and availability PUFA (esp. C18:3)
- Proportion of PUFA to SFA (saturated fatty acids)
- Feeding pattern
- Variation in fat content and fatty acid composition of feed ingredients.

Experience indicates that MFD is more likely to occur when several concurrent dietary or management factors are present, rather than as a result of a single factor. For instance, the interaction of both reduced fiber/forage and source of fatty acid in Table 1 shows the most negative effect.[3]

Other Factors to Consider

Low ruminal pH can lead to a change in rumen BH pathways resulting in formation of *trans*-10, *cis*-12 CLA and related intermediates. Ruminal pH is affected by acid production from ruminal fermentation of carbohydrate, buffer production from saliva, dietary sources of buffer, and the rate of fermentation.

Dietary inclusion of corn byproducts, such as DDGs (with variable fat content that is mainly linoleic fatty acid), fat supplements with considerable PUFA (especially linoleic acid), fish oil, and high levels of corn silage relative to alfalfa all predispose cows to MFD.

Table 1	High Fiber (50:50)		Low Fiber (20:80)	
	SFA	UFA	SFA	UFA
Fat content, %	3.58	3.36	3.33	2.40
Fat yield, lb/d	2.31	2.33	1.92	1.50

SFA = Saturated Fatty Acids: Energy Booster 100®
UFA = Unsaturated Fatty Acids: Corn Oil

Environmental factors such as heat stress and over-crowding (which lead to "slug-feeding"), and ensiled feeds with abnormal fermentation profiles (particularly high acetic acid corn silages) or moldy feeds can cause changes in BH that lead to MFD.

Furthermore, the feed additive monensin (Rumensin®) can alter rumen fermentation and the bacterial species profile, which can increase rumen outflow of *trans*-10, *cis*-12 CLA and related intermediates responsible for MFD. Two *in vitro* studies[2,4] have shown that monensin in the presence of a highly fermentable carbohydrate source and linoleic acid can lead to formation of these BH intermediates. Adding monensin can exacerbate MFD when milk fat percentage is already marginal due to the presence of previously discussed risk factors.

Factors that change the rate of passage out of the rumen should also be considered. Cows with higher dry matter intake have higher rates of passage which potentially will "flush" more BH intermediates out of the rumen, which may result in MFD.

Fat *Fast* Facts

- Certain dietary conditions alter rumen biohydrogenation (BH) pathways, producing fatty acid intermediates that inhibit milk fat synthesis.
- Ruminal BH of polyunsaturated fatty acids produce *trans*-10, *cis*-12 CLA, which reduces milk fat levels.
- Utilizing dietary fat supplements high in SFA and low in PUFA can help avoid MFD.
- Energy Booster 100 is high in SFA and low in PUFA.

[1]Bauman et al., 2001. [2]Fellner et al., 1997. [3]Griinari et al., 1998. [4]Kim et al., 2001. [5]Lock et al., 2006.

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