

TECHNICAL BULLETIN

DAIRY



USING MOLASSES-BASED QLF TO PARTIALLY REPLACE RUMEN-BYPASS FATTY ACID SUPPLEMENTS

Molasses-based sugar supplements are excellent energy and carbohydrate sources to enhance rumen fermentation and milk components. In times of high price of rumen bypass fatty acid products, it is economical to feed additional QLF to partially replace bypass fats. Due to the recent supply shortage of palmitic fatty acid (C16:0) products, multiple large herds in Midwest increased QLF feeding rate from 4 to 7 lbs/d as-fed to partially replace fat energy. To their surprise, they saw additional milk fat responses while reducing feed costs.

Here are some key points of feeding molasses-based products to replace rumen bypass fat:

Feeding supplemental fatty acids to gain milk fat is not always profitable.

Many farms feed rumen-bypass fatty acids to boost fat production, but not every farm knows if they are profitable by doing so. By feeding a palmitic fatty acid (C16:0) product, cows will usually respond with higher milk fat, but the transfer efficiency of palmitic fatty acid from feed to milk fat is generally around 20% (Lock et al. 2013; J Dairy Sci. 96:6650-6659)

Let's do a calculation here:

Based on a transfer efficiency of 20%, feeding 1 lb of palmitic fatty acid will result in 0.2 lbs of additional milk fat. If we assume the milk fat price is \$2.5/lb, 0.2 lbs of milk fat would be worth \$0.5. So if 1 lb of palmitic fatty acid also costs \$0.5 (and that would be the breakeven cost), per ton of palmitic acid would cost \$1000. So the breakeven price of the palmitic acid product is \$1000 if milk fat is at \$2.5/lb. Similarly, the breakeven price would be \$1200 if milk fat is at \$3/lb. In most cases, prices of rumen-bypass fats are above the breakeven price. If farms feed these products solely to boost milk fat, it is oftentimes not a profitable strategy.

How much rumen bypass fat can be replaced by QLF?

Fat has a higher energy density than carbohydrates. The net energy of lactation of fat is around 3 times of starch or sugars, depending on the digestibility. Generally speaking, feeding 3 lbs as-fed of QLF molasses products can replace 1 lb of rumen bypass fat to achieve a similar level of energy. In many cases, instead of cutting off 100% of bypass fat from the diet, you can use QLF to partially replace fat supplements.

The additional milk component responses from using QLF to replace bypass fat in these large herds is likely due to the fact that **1)** Increased de novo fatty acid synthesis from rumen. Fermentation of molasses in the rumen generates short-chain de novo fatty acids that contribute to milk fat production.

2) Rumen fermentation of sugar and NPN urea in QLF promotes microbial production and forage digestion, providing substrates to milk fat and protein. Our research using Fermentrics Technology found that the addition of QLF at 4 lbs/d as-fed equivalent to TMR increased estimated rumen microbial protein production by 400 g/cow/d. 3) By increasing QLF feeding rate to 7 lbs/cow/d, the total dietary sugar level is likely to hit the recommended sugar level of 7% DM. This is consistent with the meta-analysis (*de Ondarza et al., 2017, Prof. Anim Sci 33:700-707*) recommendation that 7% to 8% dietary sugar is optimal for rumen function and milk performance.

Ration models cannot correctly predict the responses of feeding sugar.

Current ration models cannot correctly predict the response of feeding sugar vs. fat on milk and milk component production. They underestimate the energy value of molasses-based feeds and cannot fully characterize the values of sugar on growing microbial protein. For example, Dr. Mike Van Amburgh of Cornell University mentioned that feeding sugar increases the population of protozoa in addition to bacteria. Protozoa is overlooked in ration programs but evidence shows that protozoa contribute up to 20% of the microbial protein yield. Furthermore, ration models cannot correctly predict sugar and urea interaction, and they also underestimate the role NPN urea plays in microbial protein synthesis even in the presence of dietary sugars. By replacing fatty acid products with QLF molasses products, ration programs are likely to severely underestimate the responses of sugars on milk and milk components. A good nutritionist understands the importance of trying it out and watching the actual responses from the cows, instead of overly relying on ration program predictions.