The composition of dietary fat supplements appears to be important for milk fat production in the lactating dairy cow’s mammary gland.

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In our first article (Feedstuffs, July 21), we reviewed the digestibility, absorption, utilization and metabolism of palmitic (C16:0) and stearic acid (C18:0) in lactating cows. This article will focus on how C16:0 and C18:0 affect milk fat production and milk fat fatty acid composition.

In a survey of retail milk in the U.S. by O’Donnell-Megaro et al. (2011) and a summary by Moate et al. (2007) of research studies reporting milk fatty acid composition, C16:0 was found to be highest in milk fat at about 26 g/100 g, followed by oleic acid (C18:1) at 20-24 g/100 g, with C18:0 comprising about half of C18:0 and C18:1. Both studies showed that C16:0 was about 80% of C18:0 and C18:1 in U.S. milk.

While milk fatty acid concentrations are rather consistent when averaged across a large number of milk samples, individual studies, especially short-duration studies, have shown that both milk fat yield and milk fatty acid concentrations can be altered by diet and types of fatty acids supplemented in the diet.

Milk production studies

Table 1 summarizes studies published that report feeding C16:0 to lactating dairy cows. Supplementation of C16:0 between 361 g and 545 g per cow per day (either in a continuous or divided manner) decreased the concentration of C16:0 in milk fat increased milk yield and milk fatty acid composition.

Milk fatty acid antagonism

The early studies of Steele and Moore (1960) were the first to look at the effects of feeding C16:0 and C18:0 on milk fat yield and milk fatty acid composition. Steele and Moore (1960a) showed that feeding 578 g of C16:0 per day or 564 g of C18:0 per day to mid-lactation cows increased milk fat by 0.11% and 0.20%, respectively, and milk fat percentage was unchanged compared to feeding no fat.

A recent study (Boerman and Lock, 2014) found that feeding 3.33% C16:0 to cows during the mid-lactation period increased milk fat yield and milk fat percentage.

Milk fluidity

Milk fat must remain fluid to leave the mammary gland, and the mammary gland is constantly forming fatty acids of different melting points to maintain fluidity. The milk fatty acid profile of C16:0, C18:0 and C18:1 is 145°F, 157°F and 56°F, respectively.

The cow’s normal body temperature of 101.5°F is well below the melting point of saturated fatty acids, and therefore, unsaturated fatty acids must be incorporated into milk fat to maintain milk fluidity. Feeding C16:0 reduced the melting point of milk fat. This decreases the ability of milk fat globules to form and decreases the amount of unsaturated fatty acids in milk.

References