Net energy value of rapeseed oil infused into the duodenum of lactating cows

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Fat is increasingly used in dairy cow feeding to reduce energy deficiency during early lactation. However, its net energy value *(NE)* is not yet accurately known because of the low levels of fat used and because of digestive interaction with other food components (Vermorel *et al*, 1986).

Five dairy cows fitted with duodenal cannula were fed *ad lib* a 60% corn silage and 40% concentrate diet. They followed a cross-over design, with (O diet) or without (C diet) rapeseed oil. Oil (1000 g/d) was continuously infused into the duodenum for 4 wk after the lactation peak. Feces and urine were collected over 6 d periods after 3 wk of adaptation. The lipids and fatty acids of feeds and feces were determined gravimetrically. Heat production was measured by indirect calorimetry for 4 d.

Milk production averaged 24.6 kg fat-corrected milk (FCM)/d with both diets and gross energy intake (including oil) 341 (s = 45) and 318 (s = 25) MJ/d in groups C and O, respectively. Energy digestibility was 71.7% (s = 1.8) and 68.8% (s = 1.6) ($P <$ 0.10), lipid digestibility 67.1% (s = 2.1) and 56.8% (s = 5.8) ($P <$ 0.05) and fatty acid digestibility 67.5% (s = 1.6) and 70.3% (s = 4.8) (NS) for the diets C and O, respectively. Lipid and fatty acid intestinal digestibility of oil were calculated by difference to be 50.8% (s = 9.7) and 71.2% (s = 6.2).

Energy gain was calculated as the mean of the respiratory quotient (RQ) and carbon–nitrogen (CN) balances. The efficiency *(kl)* of metabolizable energy *(ME)* utilization was computed by assuming that the maintenance requirement of lactating cows was 293 kJ *NEL*/kg $BW^{0.75}$. It was higher for the O than for the C diet: 60.8% (s = 3.5) *vs* 58.4% (s = 2.7), ($P <$ 0.02). The average and confidence limits ($\mu \pm t_{0.05}$ $s/\sqrt{n}$) of oil energy values were calculated from individual energy balances obtained with the 2 diets: *ME* = 19.3 ± 9.7 MJ, *kl* = 79.3 ± 17.7%, *NE* = 15.8 ± 4.7 MJ *NEL* or 2.22 ± 0.67 feed unit for lactation (UFL)/kg.

The mean *ME* and *NE* values of rapeseed oil were low, due to the poor digestibility of lipids. This latter resulted from a large excretion of unsaponifiable lipids, which might arise from alterations in the secretion and composition of bile, due to direct infusion of lipids into the duodenum. However, the mean lipid digestibility (64.7%, s = 3.6) of 6 other fat sources introduced (970 g/d, s = 205) into the diet of lactating cows (Bauchart *et al*, 1990) would result in an average *NE* value of 20.1 MJ *NEL* or 2.83 UFL/kg fat.

Bauchart D, Legay-Carmier F, Doreau M (1990) *Reprod Nutr Dev* suppl 2, 187s
Vermorel M, Sauvant D, Michalet-Doreau B (1986) *Bull Tech CRZV Theix* 66, 66-73