Maintenance energy requirements of dairy cows

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Agnew *et al.* (2000) and Kebreab *et al*. (2003) report that cows in recent years yielding up to 160 MJ milk/d (51.6 kg 4% fat–corrected milk, FCM) had a mean metabolizable energy requirement for maintenance (ME_m) of 0.63 MJ/kg$W^{0.75}$. Reasons of Agnew *et al.* (2000) for that being 30% greater than the AFRC (1993) value of 0.48 MJ/kg$W^{0.75}$ include a high fibre diet, which was not given to the cows studied, and grazing activity, though there was little grazing in these studies. Agnew *et al.* (2000) and Yan *et al.* (2003) appear to regard improved genetic merit as the primary cause. There is some variation among *Bos taurus* breeds in their ME_m which is about 17% greater than for *B. indicus* (SCA 1990); it is improbable that it could be a further 30% greater for cows improved genetically.

We suggest the high ME_m is because of increases in energy expenditures in the body to support increased production from increased intakes. Yan *et al.* (1997) measured the fasting heat productions (FHP) of cows fed near *ad libitum* before fast. The mean FHP was 0.453 MJ/kg$W^{0.75}$ (equivalent to 0.62 MJ ME) and it is known that values are greater than when the fast is preceded by feeding at maintenance level (L = 1). For feeds with ME/kg DM similar to those in the recent studies, the SCA (1990) ME_m at L = 1 for *B. taurus* is 0.537exp(–0.03A) MJ/kg$W^{0.75}$, where A is age in years (maximum 6). Increases in support metabolism for production from increased intakes are allowed for in ME_m by adding 0.1 of the ME used directly for production. Simple calculation by SCA (1990), and by AFRC (1993), of ME required in early lactation does not allow for contributions of energy from body tissues to milk synthesis; that the synthesis then is not wholly from dietary energy is allowed for by GrazFeed (Freer *et al*. 1997; Table 1). Yan *et al.* (2003) found that the SCA system gave better predictions of total energy requirement than the UK, most European, and the USA systems.

Table 1 Metabolizable energy for maintenance (ME_m) of a 650 kg cow 4 years old at day 60 of lactation calculated without (SCA) and with (GrazFeed) energy from body used for milk.

	ME_m (MJ/kg$W^{0.75}$)	
4% FCM yield kg/d	**SCA**	**GrazFeed**
20	0.55	0.51
30	0.59	0.54
40	0.63	0.58
50	0.67	0.60

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