Validation of energy requirements for fattening cattle in Germany based on extensive data from feeding trials (Validierung der Energiebedarfsnormen für Mastrinder in Deutschland auf Basis umfangreicher Daten aus Fütterungsversuchen). L. Gruber*, F.J. Schwarz, U. Meyer, K. Rutzmoser, T. Guggenberger – Irdning/ Freising/ Braunschweig/ Poing

Introduction: Since publication of "Recommendations for the supply of energy and nutrients to fattening cattle" (1) both the growth potential and the breeding goal has changed in the breeds Simmental and Black Pied (now: Holstein Friesian) used in Germany, Austria or Switzerland. The milk yield of both breeds increased considerably during this period. Furthermore, the genetic background of Black Pied progressed to the modern HF. The question arises if those breeding and therefore physiological changes of the dairy cows have an impact on the energy requirement of the progeny used for fattening purposes.

Material and methods: Fattening data sets from bulls, steers and heifers (23,314 Simmental, 3,990 Holstein) of four research institutes were pooled, essential animal and nutritional parameters being presented in table 1. One data set covers a period of 2–4 weeks of the whole fattening period. Data are from 1,720 different animals fed a forage chiefly of maize silage. The energy system was validated by regressing the ME requirements calculated on the basis of its assumptions on the actual ME intakes. The ME content of the ration components was calculated using (1) based on in vivo digestibility trials using sheep/cattle parallel to the feeding experiments.

Table 1: Mean data for validation of the engery requirements

	Irdning	Freising	Poing	Braunsch.	Bulls	Steers	Heifers	Mean	± SD
Number	8632	11213	3469	3990	22453	1598	3253	27304	-
LW (kg)	418	427	458	382	429	420	374	422	118
LWC (g/d)	1132	1398	1495	1383	1386	1348	887	1324	393
FC (MEI/LWC)	82.9	69.2	70.1	67.0	69.6	72.8	99.2	73.3	26.5
DMI (kg/d)	8.17	7.86	8.38	7.63	7.97	8.17	8.07	7.99	1.56
MEI (kJ/LW0.75)	941	967	1023	1014	973	989	963	973	126
ME (MJ/kg DM)	10.47	11.36	11.79	11.32	11.29	11.04	10.05	11.13	0.67
Concentrate (%)	29.5	30.3	32.2	33.7	31.9	30.4	23.4	30.8	10.2

LW=live weight, LWC=LW change, FC=feed conversion, DMI=dry matter intake, ME=metabolizable energy, MEI=ME intake

Results and conclusion: The main results of the validation came from the following equations:

Simmental bulls: MER = 29.0 + 0.65 × MEI [R^2 = 60.9%, RSD = 9.4 MJ ME = 10.8%]
Simmental steers: MER = 12.2 + 0.92 × MEI [R^2 = 58.6%, RSD = 12.7 MJ ME = 13.5%]
Simmental heifers: MER = 15.5 + 0.72 × MEI [R^2 = 59.8,% RSD = 9.8 MJ ME = 13.3%]
Holstein bulls: MER = -2.7 + 1.12 × MEI [R^2 = 50.6%, RSD = 16.1 MJ ME = 17.2%]

MER, MEI = ME requirement, ME intake (MJ/day) [according to (1)]

The R^2 of the linear relationship between ME requirement and intake was on a quite low level at 60% for the Simmental categories (bulls, steers, heifers) and even lower for HF bulls (51%). This corresponds to standard errors of estimated RSD of 11–17%. In absolute terms the difference between the mean MEI and MER is +3.2 and -7.3 MJ ME for Simmental and HF bulls and -4.8 and +7.6 MJ ME for Simmental steers and heifers, indicating that ME requirements are over- or underestimated in the respective categories (breed, gender). The intercepts different from zero and the slopes different from one imply that the deviations from ME requirement depend on level of intake. Closer statistical analysis shows that ME requirement for growth is primarily responsible for the deviations

(1) GfE (1995): Empfehlungen zur Energie- und Nährstoffversorgung der Mastrinder. DLG-Verlag Frankfurt/Main

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