Proc. Soc. Nutr. Physiol. (2012) 21, 80

Influence of energy supply pre- and postpartum on performance and metabolic parameters in dairy cows (Einfluss der Energieversorgung vor und nach der Abkalbung auf Produktionsdaten und Blutparameter von Milchkühen). M. Urdl*, L. Gruber and W. Obritzhauser — Irdning / Parschlug

During the last two decades numerous studies have been conducted in order to enable a smooth transition from late gestation to the early lactation period in dairy cows, and with the purpose to maximize milk production and minimize disease incidence in the subsequent lactation. Feeding strategies in these experiments have either focused on maximizing feed or energy intake, or in contrast, on limiting energy supply in the dry period. Results of these studies were inconclusive. Thus the objective of this study was to investigate the effects of precalving (PRE) and postcalving (POST) dietary energy supply (E) and their interactions on performance and metabolism of dairy cows.

Methods: A total of 81 multiparous cows (2.69±1.8 parities) of breeds Holstein-Friesian (n=27), Brown Swiss (n=27) and Simmental (n=27) with an average body weight of 662±77 kg were used in a feeding trial. The experiment was a randomized block design with a 3 × 3 factorial arrangement of treatments (3 E_{PRE} × 3 E_{POST}). Cows were studied from 84 d before expected calving until 105 d of the following lactation with diets intended to supply 75% (L), 100% (M) and $140_{PRE}/125\%_{POST}$ (H) of GfE (1) energy requirements. Diets varied in proportions of forages (grass silage, corn silage, hay differing in NEL content) and concentrate level. Feed intake was restricted if $E_{intake}>E_{treatment}$. Blood was sampled weekly before the morning feeding. Data was analysed using the MIXED procedure of SAS (metabolites log-transformed prior analysis), treatment means were compared by Tukey's method.

Results: Altering E_{PRE} significantly affected blood concentrations of glucose, non-esterified fatty acids (NEFA) and other metabolites in the dry period. E_{POST} had the greatest impact on production and metabolism variables. Energy corrected milk yield (ECM) was lower in L_{POST} than in M_{POST} and H_{POST}. Milk protein content and milk component yields increased significantly with higher energy supply. E_{PRE} affected ECM, milk fat and milk protein yield in a similar, but diminished way (L_{PRE}< M_{PRE}/H_{PRE}). There were no significant interactions between E_{PRE} × E_{POST} regarding milk yield and milk composition. Restricting energy intake of dairy cows below requirements postpartum (L_{POST}) decreased daily energy balance (DEB) and induced significant changes in glucose, β-hydroxybutyrate (BHBA), NEFA and other metabolic parameters. Accumulation of BHBA in group L_{POST} was highest 4 to 6 weeks after parturition indicating ketosis. BHBA figures of group M_{POST} also reached subketotic levels. E_{PRE} had minor effects on blood metabolites, but H_{PRE} led to a lower DEB postcalving.

Table 1: Milk production, metabolic parameters and energy status – Main effects 1–105 d of lactation

		Energy prepartum			Energy postpartum			
		L	M	H	L	M	H	RSD
DMI_{total}	kg DM	17.9^{b}	18.8^{a}	18.8^{a}	13.7^{c}	19.4^{b}	22.4^{a}	1.4
Milk yield	kg ECM	25.4^{b}	28.5^{a}	30.0^{a}	21.4^{b}	30.0^{a}	32.5^{a}	3.8
Milk fat	g/kg	41.7	42.4	42.8	44.1^{a}	42.1^{ab}	40.7^{b}	3.5
Milk protein	g/kg	32.0	32.2	32.6	30.0^{c}	32.7^{b}	34.0^{a}	1.2
Glucose	mmol/L	2.80	2.80	2.80	2.46^{b}	2.93^{a}	3.01^{a}	–
BHBA	mmol/L	0.90	0.98	0.96	1.37^{a}	0.88^{b}	0.70^{c}	–
NEFA	mmol/L	0.15^{b}	0.17^{ab}	0.19^{a}	0.26^{a}	0.14^{b}	0.13^{b}	–
DEB	MJ NEL	-7.9^{a}	-11.9^{a}	-16.9^{b}	-33.1^{c}	-9.8^{b}	6.1^{a}	6.0

[a, b, c] Means within a row with different superscripts differ significantly (P<0.05); RSD=residual standard deviation

Conclusions: To avoid negative effects on milk production, cows should not be fed below energy recommendations neither in the dry period nor in early lactation.

(1) GfE (2001): Empfehlungen zur Energie- und Nährstoffversorgung der Milchkühe und Aufzuchtrinder. DLG-Verlag, Frankfurt am Main, 136 p.

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