Effect of 2-hydroxy-4-(methylthio) butanoic acid isopropyl ester on rumen degradability of fibre in lactating dairy cows measured *in situ*

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Introduction Previous studies have reported that feeding 2-hydroxy-4-(methylthio) butanoic acid isopropyl ester (HMBi) to lactating dairy cows increases milk fat concentration, suggesting an effect on fermentation in the rumen (St-Pierre and Sylvester, 2005). In this regard it has been hypothesized that fibre utilization may be improved (Noftsger *et al*., 2005). The objective of our study was to measure incremental effects of feeding HMBi to lactating dairy cows on rumen degradability of neutral detergent fibre (NDF) in specific feeds, measured using the *in situ* procedure, and rumen concentrations of volatile fatty acids (VFA) and ammonia (NH_3).

Materials and methods Three rumen fistulated Holstein-Friesian cows in midlactation were used in a 3 x 4 incomplete Latin Square design experiment with 4 treatments and 3 week periods. Treatments were 0, 25, 50, or 75 g HMBi/d. The basal diet was a total mixed ration (TMR) provided twice daily that contained on a dry matter (DM) basis: 12.5% grass silage (GS), 37.5% maize silage (MS), and 50% maize grain-based concentrates. Degradability of NDF was measured on standardized samples of GS, MS and dried distillers grains (maize) with solubles (DDGS) using *in situ* rumen incubation of duplicate samples of each feedstuff in nylon bags over 48 (DDGS) to 72 (GS, MS) h during the last week of each period. Degradability profiles were calculated using nonlinear procedures and corrected for estimated water soluble and particle losses (Hvelplund and Weisbjerg, 2000). Rumen VFA concentrations and pH were measured in 5 samples taken just before and over 4 h after both feedings on day 19. Milk yield and composition and DM intake (DMI) were measured daily during the last week of each period. Data were analyzed using mixed models procedures and a model testing fixed effects diet and period and random effects of cow. Rumen pH and VFA concentrations were analyzed as repeated measures over time. Orthogonal contrasts were used to partition the main effect of HMBi amount into linear, quadratic (Quad), and cubic effects.

Results Feeding HMBi had no effect on DMI, milk yield, milk composition (data not shown) or MS NDF degradation (Table 1). Feeding increasing amounts of HMBi tended to linearly decrease potential degradability of NDF in GS, but rate of GS NDF degradation tended to be greater when 50 g/d of HMBi was fed (cubic, Table 1). For DDGS, feeding HMBi linearly increased rate of NDF degradation, but linearly decreased potential degradability (Table 1). Feeding increasing amounts of HMBi decreased rumen concentrations of NH_3 (quadratic, Table 1) and increased total VFA concentration (cubic, Table 1) due to increases in concentrations of all the VFA measured (data not shown).

Table 1 Incremental effects of HMBi on DMI, milk yield, grass silage (GS), maize silage (MS) or dried distillers grains with solubles (DDGS) NDF degradability, and rumen NH_3 and VFA concentrations in lactating dairy cows.

	HMBi, g/d					P<		
	0	25	50	75	s.e.	Linear	Quad	Cubic
DMI, kg/d	21.31	21.61	22.00	22.42	1.004	0.220	0.915	0.985
Milk yield, kg/d	23.73	23.35	22.61	23.35	3.777	0.399	0.285	0.416
GS NDF degradability, %	41.6	42.1	39.1	39.0	1.52	0.066	0.715	0.200
Rate of GS NDF degradation, %/h	0.041	0.036	0.051	0.032	0.006	0.623	0.256	0.084
MS NDF degradability, %	54.1	55.2	52.0	53.4	2.46	0.615	0.943	0.410
Rate of MS NDF degradation, %/h	0.031	0.028	0.034	0.031	0.005	0.804	0.954	0.331
DDGS NDF degradability, %	86.2	80.4	76.7	77.4	1.64	0.028	0.145	0.772
Rate of DDGS NDF degradation, %/h	0.039	0.049	0.051	0.053	0.005	0.036	0.250	0.630
Rumen NH_3, mg/L	184.1	165.2	156.5	165.0	7.6	0.110	0.001	0.093
Total VFA, mM	112.0	130.0	125.1	137.8	6.2	0.001	0.174	0.015

Conclusions Feeding increasing amounts of HMBi had positive effects on rumen VFA concentrations, and a negative effect on rumen NH_3 concentration, suggesting improvements in rumen fermentation. The increases in rumen VFA concentration were associated with increases in the rate of degradation of NDF from DDGS, and a tendency for an increase in degradation rate of NDF from GS when 50g/d of HMBi was fed. However, the potential degradability of NDF was reduced (DDGS), or tended to be reduced (GS), by HMBi. Effects of HMBi on rumen fermentation may have been due to effects of HMBi on microbial fermentation or populations.

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