Effects of rumen fill on intake and milk production in dairy cows fed perennial ryegrass

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Introduction Physical limitation often limits dry matter intake (DMI) of high producing cows or cows fed high forage diets. The extent to which DMI is regulated by distention in the rumen depends upon the cow's energy requirement and filling effects of the diet offered (Allen, 2000). The objective here was to challenge middle lactation dairy cows with rumen fill (rumen inert bulk – RIB) feeding ryegrass fresh cut (indoors) or grazed to determine whether RIB affects intake and milk production.

Material and methods Four high and four medium (34 and 24 kg milk/day, respectively) producing fistulated Holstein cows in mid lactation were blocked by days in milk, milk yield and body weight. The experiment was a cross-over 4 x 4 Latin square design for milk production level consisting of four 14-d periods with a factorial arrangement of treatments: indoors versus grazing, RIB versus control (without RIB). Herbage height post-cut was aimed to be identical to herbage height post-grazing. The RIB consisted of indigestible coconut fibre (NDF=92%, lignin=53% and DM degradation rate 0.0% over 360h) placed in a weighted lingerie bags. The mean volume of added RIB was 18 L of rumen displacement per cow (mean wet weight 14 kg/cow). Calculations of DMI and feeding management are described by Chaves *et al*. (2005). Wet weight of rumen digesta was measured by rumen emptying on day 13 during the measurement period at 0830 h. A weight sample of total rumen contents (5% w/w) was taken for DM determination (80^{o}C for 72 h).

Results Ryegrass heights, biomass and density were similar for cows fed indoors and grazing either at pre-cut (pre-grazed) or at post-cut (post-grazed). Ryegrass was of high quality with average values of protein concentration of 19.2% of DM and in vitro organic matter digestibility of 0.83. Herbage intake, milk yield and milksolids were lower at grazing than for cows fed indoors (Table 1). Rumen wet and DM digesta were higher for cows fed indoors compared to grazing cows. Ryegrass DM intake for cows challenged with RIB was on average 2.3 kg/d lower compared to treatments without RIB (P<0.01). This effect did not differ between grazing or indoors feeding and level of production Addition of RIB decreased both milk production and milksolids (P<0.02). The interaction RIB x ryegrass fed indoors or grazing was not significant for any variable tested. Rumen wet digesta decreased in both treatments when RIB was added and also affected both medium and high producing cows. Weight of rumen digesta DM also decreased in both treatments when RIB was added.

Table 1 Ryegrass intake (kg/d), milk yield (kg/d) and rumen mass (kg) for 4 cows fed indoors or 4 cows grazing without or with added rumen-inert bulk (RIB)

	Treatments					Main effects (*P*<)		
	Indoors	Indoors + RIB	Grazing	Grazing + RIB	SE	RIB	Indoors/ grazing	Production level
DM intake estimated by Yb marker	19.8	17.5	17.6	15.3	0.8	0.02	0.02	0.02
Milk	26.3	24.9	24.7	22.4	0.7	0.02	0.02	0.02
Milksolids (milk fat+milk protein)	1.78	1.68	1.68	1.54	0.04	0.02	0.02	0.08
Rumen wet digesta	109	87	91	73	3.6	0.001	0.001	0.012
Rumen wet digesta plus RIB	109	101	91	87	3.5	0.11	0.001	0.011
DM rumen digesta	13.2	10.0	9.9	8.7	0.7	0.007	0.006	0.004

SE = standard error; DM = dry matter.

Conclusions Addition of rumen inert bulk (RIB) decreased ryegrass intake and milk production in both medium and high producing dairy cows. This proves the hypothesis that ruminal distention influences forage intake in ruminants even when high quality forage is fed.

References

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