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Effect of *Aspergillus oryzae* fermentation extract (Amaferm) on fermentation in the rumen simulation technique (Rusitec)

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Probiotics (microbial preparations and their growth media) are of increasing interest as feed additives for both ruminant and non-ruminant livestock. Amaferm is a fermentation extract prepared from cultures of the fungus *Aspergillus oryzae* which, when included in the diet of dairy cows, increases the yield of milk and buttermilk (Harris *et al.*, 1983). These improvements have been associated with changes in rumen fermentation (Weidmeier *et al.*, 1987). The present study describes the use of the rumen simulation technique Rusitec (Czerkawski and Breckenridge, 1977) to investigate the effects of increasing doses of Amaferm on the stoichiometry of rumen fermentation *in vitro*.

Amaferm was added at 0, 25 and 250 mg/d to duplicate Rusitec vessels and at 1 g/d to a single vessel, receiving 10 g/d of a mixed diet of hay, barley, molasses, fishmeal and vitamins/minerals (500, 299.5, 100, 91 and 9.5 g/kg DM respectively). Vessels were initially inoculated from animals receiving the same diet. Artificial saliva was continuously infused into the vessels (total volume 850 ml, dilution rate 0.88/d) and feed bags were changed daily such that each bag was incubated for 48 h. Samples were taken at the time of feeding after 15 d adaptation to Amaferm.

Amaferm had no influence on total VFA concentrations but there was a shift towards an increased proportion of butyrate as the level of addition increased. Ammonia production was also stimulated by the addition of Amaferm, with the concentration in the vessel receiving 1 g/d being almost twice that found in the control vessels. There was no effect on dry matter disappearance after 48 h. The concentration of methane in the gas collected from the head space of the vessels was decreased by Amaferm, with the maximum decrease (17%) being seen at the level of 250 mg/d.

Stimulation of butyrate and ammonia production by Amaferm have previously been reported *in vitro* (Arambel *et al.*, 1987) and *in vivo* (Weidmeier *et al.*, 1987). This study has demonstrated that similar effects are observed in Rusitec. In addition the results are unique in suggesting an effect of Amaferm on CH₄ production; if this result can be replicated *in vivo* then Amaferm may have far reaching effects on the stoichiometry of the rumen fermentation.

References

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- Harris, N., Van Horn, H.H., Manookian, K.E., Marshall, S.P., Taylor, M.J. & Wilcox, C.J. (1983) Sugar cane silage, sodium hydroxide and steam pressure treated sugar cane bagasse, corn silage, cottonseed hulls, sodium bicarbonate and *Aspergillus oryzae* product in complete rations for lactating cows. *Journal of Dairy Science* **66**, 1474-1485.
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Effect of Amaferm on fermentation products in Rusitec

	Level of AMAFERM addition/day			
	0 ^a	25 ^a	250 ^a	1000 ^b
TVFA (mmol/l)	133	123	119	148
Acetate (mmol/mol)	490	484	475	461
Propionate (mmol/ml)	250	242	231	223
Isobutyrate (mmol/mol)	8.6	9.3	9.2	8.8
Butyrate (mmol/ml)	161	176	188	198
Isovalerate (mol/mol)	36	38	32	35
Valerate (mmol/mol)	49	46	64	67
Acetate/Propionate	1.96	2.00	2.06	2.07
NH ₃ -N (mg/l)	75.8	79.0	87.0	145.7
Digestion g/d of DM after 48 hr incubation (input of DM was 10 g/d)	6.75	6.67	6.65	6.55
Head space gas %				
H ₂	0.03	0.06	0.05	0.03
CH ₄	10.6	9.2	8.8	8.9

^a mean of observations from 2 vessels
^b observation from single vessel