

The effect of accelerated diet step-up rate on performance of feedlot steers dosed with *Megasphaera elsdenii* NCIMB 41125

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Introduction

Newly-arrived feedlot cattle are usually adapted to the high-starch grower/finisher diet (Top Diet) by first feeding them a high-roughage starter diet and then gradually decreasing roughage content, over ca. 3 wk, by feeding a series of step-up diets. This practice was developed to prevent digestive disturbances, notably acidosis, that occur when cattle go directly onto the Top Diet. The step-up regime allows *M. elsdenii*, the primary lactic acid-utilising bacteria in the rumen, to increase from low levels associated with roughage feeding to that commensurate with ruminants adapted to high starch diets. *M. elsdenii* NCIMB 41125 was isolated from the rumen of cattle adapted to high starch diets (C.H. Horn *et al.*, personal communication). Earlier studies (unpublished) showed that giving *M. elsdenii* NCIMB 41125 to cattle as a single oral dose established a viable, lactate-utilising population of *M. elsdenii* in the rumen right away, with levels of ca. 10⁹ live cells/ml being reached within 24 h. It is hypothesised that orally dosing cattle on arrival at the feedlot with *M. elsdenii* NCIMB 41125 will allow them to go onto the Top Diet sooner, without any adverse effects. This may allow a significant reduction in the number of step-up diets needed and the amount of roughage required in feedlots. It will also enable cattle to attain a higher energy intake earlier, when efficiency of energy utilisation is relatively higher. The objective of this study was to see how rapidly newly arrived feedlot cattle may be stepped-up when they are orally dosed with *M. elsdenii* NCIMB 41125.

Material and methods

The study followed a regression approach with six treatments, each having a different starting roughage level and then the roughage level decreasing, at a similar rate for all treatments, over subsequent days until the final Top Diet roughage level of 5% was reached (Table 1).

The decrease in roughage level for the respective treatments was accomplished by daily mixing Starter Diet (S) and Top Diet (T) in the desired ratios. Diets S and T, respectively, contained (g/kg DM) grass hay (175, 50), ground corn (564, 734), wheat bran (100, 60), protein mix (85, 80), molasses (50, 50), urea (10, 10), mineral-vitamin mix (16, 16) and starch (407, 520), NDF (302,

Table 1. Dietary treatments with different starting roughage levels (% of DM) and subsequent different number of days required to reach the Top Diet containing 5% (DM) roughage.

Treatment number	Starting roughage level on d 1	Roughage level of Top Diet	Day reaching Top Diet
1	17.5	5.0	21
2	15.0	5.0	17
3	12.5	5.0	13
4	10.0	5.0	9
5	7.5	5.0	5
6	5.0	5.0	1

198) and CP (147, 146). Once the Top Diet was reached within each treatment, steers continued on it until the end of the trial on d 35. Thirty-six Bonsmara type steers, with no previous exposure to concentrate diets, were used. Upon arrival at the feedlot they received only roughage and water *ad libitum*. Steers were blocked according to BW and allocated randomly to the 6 treatments. They were kept in single pens and fed *ad libitum*, twice per day, throughout the trial. Individual feed intake and BW was determined daily and weekly, respectively, from d 1 to 35. At 08.00 h on d 1, just prior to feeding the respective concentrate diets for the first time, each steer received a single 100 ml oral dose of a suspension containing *M. elsdenii* NCIMB 41125 (minimum 10^8 live cells/ml). Regression analysis was done, using GenStat® (VSN International Ltd, 2007, Hemel Hempstead, UK) to determine the relationship between performance variables and diet step-up rate. No non-linear relationships were found and data are given for linear analysis. Statistical significance was set at $P < 0.05$ and trends are discussed at $P < 0.10$.

Results

Linear regression between performance variables and diet step-up rate was non-significant ($P > 0.05$) for DM intake and feed conversion ratio, but showed a positive trend ($P < 0.10$) for BW gain (Table 2). Practical experience in the feedlot industry would suggest that increasing diet step-up rate, beyond the established norm (roughly corresponding to treatment 1 in the present study) will lead to a loss in performance and to health problems. The results of this study indicate that in cattle dosed with *M. elsdenii* NCIMB 41125 step-up rate could be increased, even to the point where cattle go directly onto the Top Diet (treatment 6), without any adverse effect. On the contrary, the higher energy intake, made possible by reaching the Top Diet earlier, can result in improved performance, as suggested by the increase in BW gain (Table 2).

Table 2. The effect of diet step-up rate (i.e. days taken to reach the Top Diet) on performance (d 1 to 35) of feedlot steers receiving a single oral dose of *M. elsdenii* NCIMB 41125 at the start of the feeding period.

	Day reaching Top Diet						Regression	
	21	17	13	9	5	1	SE	P-value
Starting BW, kg	228	228	228	230	234	228		
DM intake, kg/d	4.94	5.19	5.07	4.43	5.43	5.32	0.380	0.57
BW gain, kg/d	1.04	1.05	1.21	1.27	1.14	1.25	0.075	0.09
kg feed DM/kg gain ¹	5.25	5.23	4.31	3.54	4.91	4.28	0.634	0.28
No. of pulls ²	1	0	1	1	1	1		

¹ Feed conversion ratio.

² Animals showing symptoms of digestive or respiratory health problems.

Conclusion

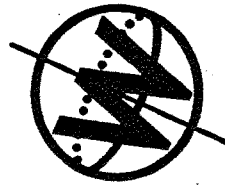
Dosing cattle with *M. elsdenii* NCIMB 41125 may reduce or eliminate the need for a series of step-up diets in the feedlot, resulting in savings on the cost associated with procurement, storage and handling of roughage. In the present study the accelerated step-up rate did not result in lower performance, on the contrary there was a tendency for increased BW gain. However, the trial covered only the critical feedlot adaptation period and follow-up work is required to evaluate the response over the entire fattening period.

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