

Effect of double-muscling and of removing maize silage, fed besides concentrates, on the chewing behaviour of bulls*

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ABSTRACT

To determine if beef bulls adjust their chewing pattern to avoid ruminal acidosis, the chewing behaviour of double-muscled (dm) and non-dm bulls was studied with a concentrate based diet, with and without maize silage. Conformation (dm or not) did not influence the chewing behaviour. Daily rumination time was more strongly affected by the roughage portion than the daily eating time. Removing the maize silage induced a shift towards more rumination during the night. Conclusively, bulls did not adjust their chewing pattern to the acidotic rumen load.

KEY WORDS: chewing behaviour, concentrate, double-muscling, bulls, maize silage, ruminal acidosis

INTRODUCTION

Phy and Provenza (1998) and Cooper et al. (1999) proved that sheep fed grain preferred rations that contain NaHCO_3 to avoid acidosis. If bulls adjust their pattern to avoid ruminal acidosis when physical structure supply is marginal, is unknown. De Campeneere et al. (2004) mentioned potential adaptations of the chewing pattern to reduce rumen acid load.

In this study, chewing behaviour was investigated with a concentrate based diet, with and without maize silage (MS). By using double-muscled (dm) and non-dm bulls the influence of the conformation on chewing behaviour was investigated. The reason for comparing both conformational types was mentioned by De Campeneere et al. (2004).

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MATERIAL AND METHODS

During the first week 12 Belgian Blue bulls (6 dm and 6 non-dm; \pm 18 months old) were fed 25% MS (NDF content: 41% of DM) and 75% concentrate (C; NDF content: 31% of DM) (DM-basis). After that week, the dietary roughage part decreased slowly each week until 100% C was fed, 5 weeks later. The structural value of the MS and the C, calculated according to De Brabander et al. (1999), amounted to 1.63 and 0.28 per kg DM. The mixed rations were fed individually to appetite in one meal at 9.00 AM. The grains in the C were rolled, other ingredients remained unground.

The 5th, 6th and 7th day of the first (25% MS) and last week (100% C) chewing behaviour was recorded continuously. Analysis of the chewing pattern and the housing conditions were described by De Campeneere et al. (2204).

RESULTS AND DISCUSSION

The 12 bulls weighed 621 ± 37 kg during the 25% MS week and 647 ± 31 kg during the 100% C week. Intake and chewing parameters are listed in Table 1.

Effect of conformation

Conformation did not influence the intake level, which is mostly considered to be lower in dm animals (Fiems et al., 1997). The dm bulls had no more meals or rumination periods than the non-dm bulls. The rate of intake was not significantly different between the two conformation types. Thus, no indications were found of an influence of the conformation on the chewing behaviour.

Effect of removing MS

Strong indications of a lowered feed intake were found for the 0% MS. Removal of the MS did reduce significantly the number of rumination periods and the time spent ruminating but did not influence the number of meals or the time spent eating. On the 100% C diet, the bulls spent 69 min ruminating daily or about 8 min per kg DM. Eating and rumination time/kg DM were significantly higher and lower, respectively, for the diet without MS. From the 12 observations on the 100% C diet, only one bull did not ruminate during the three-day recording period.

In contrast to earlier studies with cows fed 100% concentrate (grain-based) diets where regular mastications were seldom seen (Bines and Davey, 1970), several periods of rumination were recorded at 100% C in this experiment.

Table 1. Intake and chewing parameters for diets based on C with 25 or 0% MS

Conformation		Non-dm		dm		SEM	P-value	
Portion of maize silage, %		25	0	25	0		dm/ non-dm	% MS
Number of animals		6	6	6	6			
Intake	kg DM/day	9.2	8.5	8.6	7.9	0.3	0.21	0.15
	MJ NE/day	75.8	72.8	70.9	67.2	2.0	0.20	0.42
	g DM/kg LW ^{0.75}	72.9	65.7	70.8	61.8	2.1	0.46	0.06
	g NDF/kg LW ^{0.75}	23.5	20.0	22.8	18.8	0.7	0.47	<0.01
Eating	periods/day	22.1	22.2	21.0	21.0	0.9	0.56	0.98
	min/day	179	189	168	199	7	0.96	0.14
	min/kg DM	19.5	22.2	19.7	25.5	0.8	0.21	<0.01
Rumination	periods/day	11.7	7.3	12.9	5.1	1.0	0.74	<0.001
	min/day	224	81	287	57	25	0.54	<0.001
	min/kg DM	24.0	9.4	32.7	7.2	2.6	0.31	<0.001

Hourly chewing pattern

The distribution of the eating and rumination activity over a 24-h interval after feeding is shown in Figure 1. Only small differences existed in eating patterns between the 2 diets. The most important meal was recorded during the first h after feeding, being on average 18% of the total eating time. In general, eating took predominantly place during the first 12 h postprandial, while ruminating was

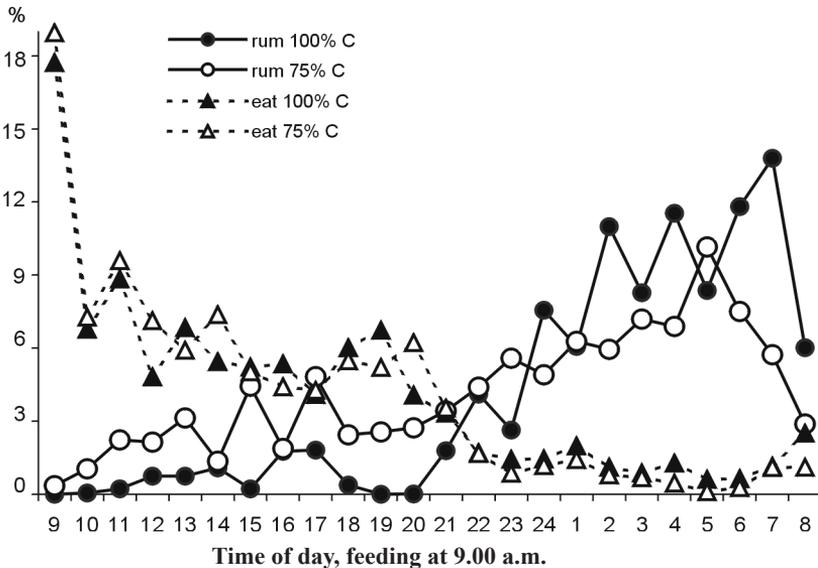


Figure 1. Percent of the daily eating (eat) or ruminating (rum) time spent during each hour of the day (h postprandial) for diets with 100 and 75% C

more night related. Increasing the C level, reduced the percentage of the total daily rumination time during the first 12 h from 29 to 7%, being a shift towards relatively more rumination during the night period. At the same time, no important shift in relative eating time was found. This shift implies that total chewing time during the first half of the day (when by far the acid load for the rumen is highest) is relatively lower for the 100% C diet than for the diet with MS. These results suggest that bulls did not adjust their chewing pattern in relation to the acidotic rumen load, which was highest during daytime.

CONCLUSIONS

The conformation of the animal had no influence on chewing behaviour. For the 100% C diet significant rumination activity was recorded. Removing the MS from the diet had no influence on time of eating, but induced a shift towards relatively more rumination during the second half of the day. From these results it is concluded that bulls did not adjust their chewing pattern in relation to the acidotic rumen load to avoid ruminal acidosis.

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