

Evaluation of eating and rumination behaviour using a noseband pressure sensor in cows after right-flank laparotomy for correction of left displaced abomasum

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Introduction

The goal of this study was to investigate eating and rumination behaviour in cows during the first five days after surgical correction of left displaced abomasum (LDA). In addition, it should be examined if the values obtained differed from those obtained from healthy control cows.

Animals, Material and Methods

As controls, ten cows, 4.1 ± 1.65 years old, were used. They were 170 ± 53.6 days in milk, and daily milk yield amounted 28.2 ± 4.8 kg. Ten cows with left displaced abomasum, 5.0 ± 1.05 years old, underwent right-flank omentopexy for correction of LDA. They were from 5 to 77 days (median, 14 days) in milk, and daily milk yield before the occurrence of LDA amounted 30.5 ± 6.47 kg. All cows underwent clinical examination to confirm that they were healthy (controls) or had LDA. The operation and postoperative treatment of cows with LDA was performed as described earlier (Braun et al., 2011). The cows had free access to hay and water. In addition they received 2 kg corn pellets and 2 kg protein concentrate. The recording of eating and rumination was performed using pressure sensor technique as described (Braun et al., 2013) for five days immediately after surgery. For each cow, the following variables were determined from the uploaded data: Total daily eating and rumination times; number of regurgitated cuds per day; number of chewing cycles per cud. The statistical analysis included the calculation of means and standard deviations and the performance of the Wilk Shapiro-test for normality. Differences within groups were analysed using the Bonferroni test. A value of $P < 0.05$ was considered significant.

Results

The results of the initial clinical examination were described in detail (Trösch, 2013). The control cows were healthy and had a normal appetite throughout the study period. In LDA cows, general condition and demeanour were affected and appetite and milk yield were reduced. Activities of liver enzymes were elevated. Seven cows had elevated urinary acetoacetate concentrations. All LDA cows had abomasal reflux syndrome. The general condition and demeanour of the operated cows normalised within two to three days and the cows were discharged from the clinic after another two or three days following the three-day postoperative therapy.

The mean total daily eating time did not change during the five-day study period and did not differ between the two groups (Tab. 1). It varied from 425 to 469 minutes in the controls and from 384 to 409 minutes in the LDA cows. The mean total daily rumination time varied from 441 to 479 minutes in the controls. In LDA cows, it increased significantly and from 378 minutes on day 1 to 501 minutes on day 5 ($P < 0.05$). The mean daily number of chewed cuds did not differ within and between groups, whereas the mean number of chewing cycles per cud differed significantly. It ranged from 58 to 60 in controls and from 43 to 54 ($P < 0.01$) in LDA cows. In the latter, the number of chewing cycles per cud increased significantly over the five-day study period ($P < 0.05$).

Discussion

The mean total daily eating time varied from 425 to 469 minutes (7.1 to 7.8 hours), compared with 4 hours (Freer et al., 1962), 4.2 hours (Freer and Campling,

DOI 10.17236/sat00025

Received: 27.05.2014
Accepted: 20.08.2014

Table 1: Eating and rumination behaviour during five days in ten healthy control cows and in ten cows after omentopexy for surgical correction of LDA (mean ± sd, range in parentheses).

Variable	Group	Day				
		1	2	3	4	5
Total daily eating time (min.)	Controls	441±65 (363–580)	433±70 (332–523)	469±72 (326–540)	456±58 (368–551)	425±43 (392–530)
	LDA	384±112 (259–598)	477±61 (392–598)	438±72 (364–510)	439±70 (304–536)	409±96 (251–566)
Total daily rumination time (min.)	Controls	441±69 (331–524)	461±49 (381–546)	475±34 (431–527)	479±42 (429–535)	479±55 (368–542)
	LDA	378±118 (191–542)	496±77* (398–603)	488±89 (345–654)	482±82 (356–598)	501±71* (403–616)
Number of cuds per day	Controls	475±112 (307–663)	509±86 (374–666)	486±102 (343–667)	533±83 (419–681)	532±77 (401–633)
	LDA	465±122 (255–625)	574±72 (457–675)	521±73 (416–634)	536±67 (421–658)	550±85 (440–679)
Chewing cycles per cud	Controls	58±4 (52–65)	60±5 (50–68)	60±4 (56–67)	60±4 (52–64)	59±5 (52–66)
	LDA	43±6 (34–57)	47±8 (36–64)	50±6 (40–59)	52±5* (46–64)	54±6* (47–65)

1965), 5.5 hours (Welch and Hooper, 1988; Senn et al., 1995), 4 to 7 hours (Beauchemin, 1991), 4 to 9 hours (Gürtler, 1974) and 4 to 12 hours (Dulphy et al., 1980). A possible reason for the shorter eating times in the 1960s (Freer et al., 1962; Freer and Campling, 1965) is the much smaller production level at that time, which was associated with smaller caloric requirements. The modern dairy cow is bred for high milk yield, which necessitates increased feed intake and thus longer eating times. The total daily rumination time of 441 to 479 minutes (7.4 to 8 hours) corresponded to the upper range reported in other studies (4 to 9 hours; Gürtler, 1974; Hill, 1976; Dulphy et al., 1980; Beauchemin, 1991). The mean number of cuds per day varied from 475 to 533 compared with 360 to 790 (Gürtler, 1974) and 400 to 480 cuds (Piatkowski et al., 1990). In our study, the mean number of chewing cycles per cud was 58 to 60 compared with 52 (Welch and Hooper, 1988) and 40 to 60 (Gürtler, 1974) reported earlier. The number of chewing cycles per cud depends largely on the fibre content of

the ration (Beauchemin, 1991); the cows of the present study were fed hay free choice, which may have contributed to the relatively large number of chewing cycles per cud.

In LDA cows, rumination time increased significantly from 378 minutes on day 1 to 501 minutes on day 5. Also, the mean number of chewing cycles per cud increased significantly over the course of the observation period from 43 to 54 chewing cycles per cud. These increases were a reflection of gradual improvement in health and possibly also due to pain control with flunixin meglumine. By contrast, the daily number of cuds did not differ between the two groups. The main effects of right flank omentopexy and postoperative treatment in cows with LDA on the rumination and eating variables were an increase in the daily rumination time and an increase in the number of chewing cycles per cud and per day.

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