THE EFFECT OF IMPLANTATION OF RUMEN CANNULAS ON VOLUNTARY INTAKE AND RUMEN FERMENTATION

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11 Zebu bulls of mean live weight 180 kg were used to determine the effect of inserting rumen cannulas on voluntary feed and water intake as indices of physiological normality. The cannulas were inserted by the string purse method, the entire procedure being completed in one operation. The same diet was maintained through the trial consisting of chopped cane tops fed at libitum with 10 g of urea/kg fresh cane. In addition, each animal received 1000 g/d of rice polishings, minerals and water to appetite. Voluntary erotic fell during the 7 days after the operation. The lesions were healed in 15 days. Mean values (± SE) for dry matter intake (kg DM/d) for the 14 days before the operation were 3.18 ±.11 and from 8 to 21 days after the operation 3.87±.08 ; this difference was not significant. It seems animals fitted with rumen cannulas by this particular operation will give reliable results when used to examine rumen parameters in experiments involving measurements of voluntary intake under conditions of ad libitum feeding.
Key words: cattle, rumen cannulas

In nutritional studies on ruminant animals, related to practical feeding systems, ruminally fistulated animals are widely used. As the pattern of rumen fermentation can be changed, sometimes quite dramatically, by levels of feeding (Eadie et al 1970) it is important that levels of feed intake under ad libitum systems, for such preparations should be comparable to those of normal intact animals.

It has been suggested that the implantation of ruminal fistulas could affect the physiology of the animals in that the operation, and the adhesion of part of the dorsal sac to the body wall, might affect the movements of the dorsal sac which are associated with iructation and secondary contractions of the rumen (Iggo and Leek 1970). Reduction of the force or frequency of such contractions could affect rumen outflow and voluntary intake.

There is little information in the literature comparing ruminally fistulated and normal animals except by comparisons of overall digestibility (Droori and Loosli 1959). The objectives of the present experiment were therefore to study the effect of a simple rumen fistulation on voluntary intake, post-operative recovery time and the reestablishment of rumen fermentation parameters.

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Materials and Methods

Animals, Diets and Housing: Eleven Zebu steers of approximately 180 kg live weight were housed in individual pens to facilitate measurement of voluntary intake of feed and water. The diet consisted of chopped cane tops with 10 g of urea/kg of fresh tops and salt, mineral mix and water at free access. A supplement of 1 kg of rice polishings was given daily. The same regimen was maintained throughout the experiment except for a 24 hr fast before the operation and for the day of the operation, when the feed available was reduced to half the previous average consumption.

Surgical procedure: After a 24 hr fast the animals were tranquillized with combelen (N-3 propionylphenothiazine) (1 ml/100 kg body weight) and the operational area blocked with xylocaine, adrenalin being used as a vasoconstrictor.

A circular dissection of the skin was made in the centre of the perilumbar fossa. The muscles and peritoneum were torn to expose the rumen, which was drawn to the outside and a longitudinal incision made to allow the cannula, with a flexible rubber ring attached to a string, to be passed through to the interior of the rumen. The rumen, peritoneum, muscles and skin were then sutured at intervals. The cannula was then drawn with the string into the fistula and secured with an external rubber ring and threaded securing ring and finally capped. Figure 1 illustrates the method of operation.

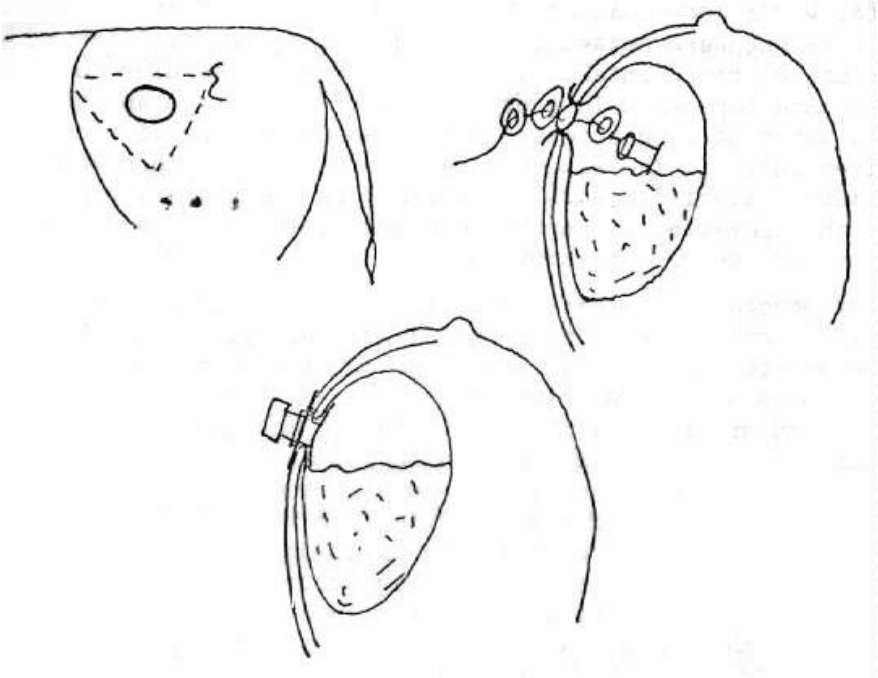
Table 1:
Mean volume for rumen fermentation parameters one hour before feeding (7.00 hr) and 6 hr after feeding (14.00 hr) on days 24 and 26 after the operation

	7.00 hr		14.00 hr	
	24 d	26 d	24 d	26 d
VFA.m - equiv/litre				
Total	98.4 ± 6.89	91.2 ± 6.84	120.5 ± .23	125.4 ± 19.25
Acetate	75.5 ± 3.35	73.1 ± 6.57	90.2 ± 5.34	94.5 ± 15.05
Propionate	13.2 ± 1.12	11.5 ± 0.46	20.1 ±1.78	21.4 ± 3.10
Butyrate	7.46 ± 0.42	5.82 ± 0.20	8.59 ± 0.31	8.46 ± 1.48
Valerate	1.91 ± 0.54	0.78 ± 0.14	1.27 ± 0.44	1.07 ± 0.14
pH	6.54 ± 0.02	6.50 ± 0.03	6.24 ± 0.03	6.38 ± 0.03
Protozoal biomas,[1]%	0.11 ± 0.06	0.14 ± 0.05	0.41 ± 0.15	0.36 ± 0.10
Ammonia, m - equiv/litre	32.0 ± 1.43	30.4 ± .67	28.5 ± 1.47	31.8 ± 0.85

[1] As packed cell volume, % of rumen fluid

Analytical Methods: Volatile fatty acids (VFA) were determined by gas chromatography using caproic acid as internal standard: pH was by glass electrode on freshly drawn large samples: ammonia was by micro diffusion and "protozoal biomass" by the method of Leng et al (1976)

Figure 1:
Inserting a rumen cannula by the purse string method



Results

In the first 7 days after the operation, the animals recovered gradually their previous voluntary intake. Average consumption of DM before the operation was 3.98 ± 0.11 (x ± SEx) kg/day and for the period from day 7 to day 22 after fistulation average daily consumption of DM was 3.87 ± 0.08 kg/day(figure 2). Complete cicatrization of the tissues required about 15 days.

In the diurnal patterns of feed consumption and behaviour, comparing animals before and after fistulation, some 80% of all consumption occurred between 5 a.m. and 5 p.m. with the night period devoted to rumination and sleeping. Patterns of water consumption were also unchanged (figure 3),

Figure 2:
Daily intake of DM before and after the implantation of the cannula

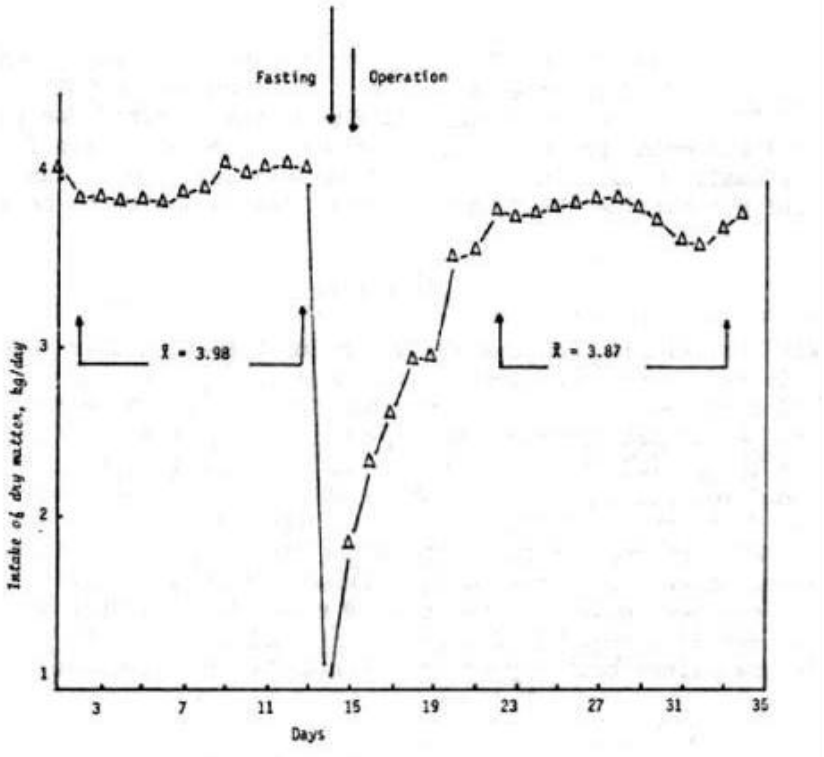
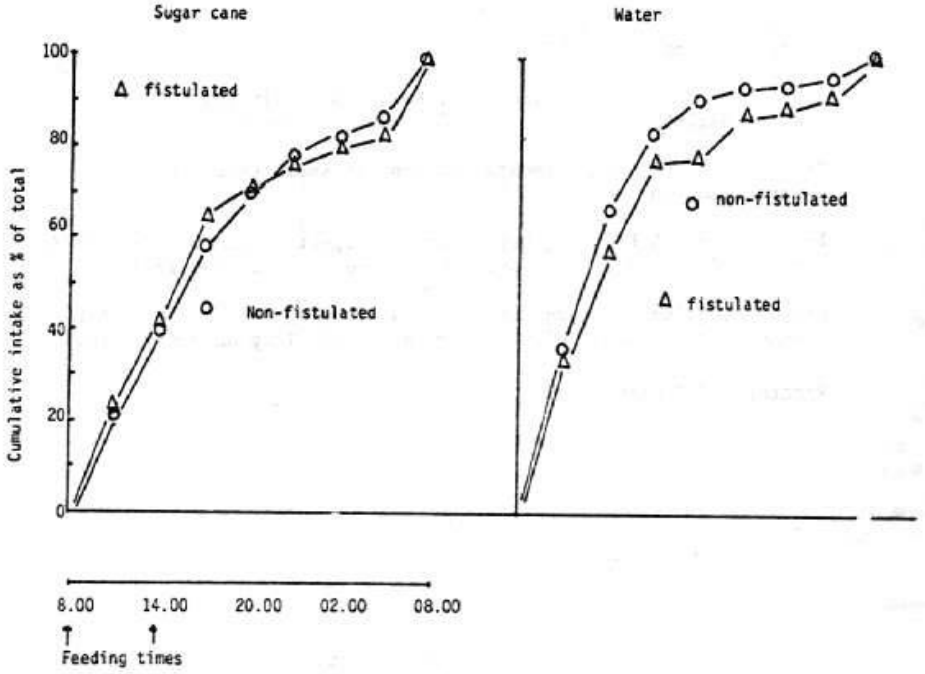


Figure 3:
Pattern of feed and water intake



At 24 and 26 days after the operation, a series of samples of rumen fluid were taken at 7 a.m. and 2 and examined for pH, total VFA and molar proportions, and other parameters shown in table 1. Some small changes in butyric and valeric acid proportions were found but not outside the range of day to day variation to be expected.

Discussion

With the simple, one stage fistulation operation used here, wound repair is rapid and uncomplicated and there is rapid recovery of appetite and consequently of rumen microbial function. Therefore there seems to be no need for two stage operations, which must necessarily increase the period of stress on the animal (Hecker 1974).

The demonstration of restoration of normal function is of course, only valid for the technique and size of fistula used here.

Animals prepared in this we' can be confidently used three to four weeks after the operation in studies involving ad libitum feeding. However we have observed that there is considerable excitation at first sampling from the fistula. It is advisable to have several practice samplings before placing the animals on experiment.

References

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