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A NOTE ON CONTAMINATION OF OESOPHAGEAL FISTULA SAMPLES WITH RUMEN INGESTA

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Of the numerous methods available for studying the diet of grazing animals, the oesophageal fistula has many advantages over other methods (McManus, 1961; van Dyne & Torell, 1964; van Dyne, 1968). One of the many factors affecting the validity of oesophageal fistula samples is the occurrence of contamination of the samples by regurgitated rumen ingesta. Although contamination of oesophageal fistula samples has frequently been mentioned (McManus, 1961; Cook, 1964), no information on the frequency and extent of such contamination could be found in the literature reviewed.

In a study of oesophageal fistula samples obtained from pen-fed sheep, sample recoveries in excess of 100% were recorded. Three sheep, provided with oesophageal fistulas following the method of Hofmeyr & Vos (1964) were used to samples three pelleted rations. The rations were lucerne hay, lucerne hay and maize (60:40) and *Eragrostis curvula* hay, and were all ground through a moderately-fine (6 mm) sieve prior to mixing and pelleting. The average dry weight, the percentage recovery and the saliva content of the oesophageal fistula samples appear in Table 1. These data represent three 15-minute collections by each of the sheep on each of the rations. The sheep were not fasted prior to sampling and collections were made at intervals of 2 to 3 days.

Variations in sample weight between animals and between collections have frequently been reported(Arnold, McManus, Bush & Ball, 1964; (Cook, 1964). The differences in sample weight between rations (Table 1) appear to be due to differences in palatability. As a portion of the feed consumed by oesophageal fistulated animals is normally swallowed (i.e. escapes collection) and an unknown amount of rumen ingesta may be added to the sample by regurgitation, the values in Table 1 do not necessarily represent the true recovery. The true recovery will, in fact, be somewhat less than that indicated in Table 1. The overall average apparent recovery of the samples consumed was 91%. The differences between rations for the recovery of samples were small and are probably due to the fact that all rations were pelleted to the same size pellet. The range of sample recovery was large and 5 out of a total of 27 samples collected (19%) showed weight increases. These weight increases were, however, small and only exceeded 2% in 2 of the 5 samples. In most cases recoveries exceeding 100% were associated with large sample weights. It may be assumed that these weight increases are mainly due to regurgitated material, although the dry matter of the added saliva would make some contribution (saliva contains 1,1% dry matter according to Spector, 1961). Contamination of the samples by rumen ingesta cannot always be determined, particularly where small amounts are added or where the chewed sample and ingesta have a similar appearance. The appearance of rumen ingesta and chewed feed samples from ruminants on a pelleted or finely-ground ration have a greater similarity than those from grazing animals or animals fed coarse roughages. Although this suggests that contamination by rumen ingesta would be more easily detected in the graz-

Table 1

Sample weight, recovery and saliva added to rations consumed by oesophageal fistulated sheep

Ration		Dry weight of sample (g)	Apparent sample recovery (%)	Apparent saliva secretion (g) per 100 sample DM
Lucerne hay	mean	281	93	139
	range	111-432	58-111	80-319
	S.D.*	±126	± 16	±76
Lucerne hay + maize (60:40)	mean	319	88	194
	range	90-539	53-99	99-575
	S.D.*	± 160	± 20	±160
Eragrostis curvula hay	mean	126	91	199
	range	79-217	66-113	42-399
	S.D.*	±47	±18	± 98

* S.D. = Standard deviation

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ing animal, the possible occurrence of contamination should not be ignored.

The moisture present in oesophageal fistula samples may originate from either the saliva or from regurgitated rumen ingesta. The true saliva content of these samples can therefore not be ascertained unless the degree of contamination (if any) by rumen ingesta is known. It is, however, reasonable to assume that the greater percentage of this moisture originates from saliva. The large variation in the apparent saliva secretion per unit feed consumed is noteworthy. This is due to the fact that one of the oesophageal fistulated sheep often ate only a few mouthfuls of feed at the beginning of the collection period and refused to eat any more until its fistula plug was replaced, when it immediately resumed normal eating. The amount of saliva (apparent) added per 100 g dry matter collected by this animal was almost twice that added by the other two sheep.

Table 2

Dry matter composition of feed and oesophageal fistula samples

Ration sampled	Crude* Protein %	Crude* Fibre %	Ash %
Lucerne hay			
Feed sample	18,4	33,7	10,5
Fistula sample	19,3	34,9	11,8
Difference (%)	+4,5	+3,5	+12,4
Lucerne hay + maize			
Feed sample	15,4	21,8	6,5
Fistula sample	16,7	22,1	8,3
Difference (%)	+9,0	+ 1,5	+27,7
E. curvula hay			
Feed sample	11,2	24,5	8,1
Fistula sample	12,1	24,5	9,7
Difference	+7,7	0,0	+19,7

* Expressed on an ash-free basis.

The protein and fibre content (on an ash-free basis) and the ash content of the feed and oesophageal fistula samples are presented in Table 2. The difference in the fibre content of the feed and fistula samples is relatively small and probably insignificant. The increase of approximately 20% in the ash content is slightly higher than that reported by Lombard & van Schalkwyk (1963) for a pelleted ration. Ruminant saliva contains 0,7 to 0,9% ash (McDougall, 1948) and with an average of 117 g of saliva added per 100 g of sample collected in this study, the increase in ash content would be expected to be approximately 15%. The increase in ash content of the oesophageal fistula samples found in this study can, therefore, be almost entirely attributed to salivary ash contamination. The low nitrogen content of saliva (0,014% according to Marshall, Torell & Bredon, 1967) would not be expected to increase the protein content of the fistula samples to any marked degree. The relatively small increase in the protein content of the fistula samples is not regarded as particularly significant.

Van Dyne & Torell (1964) have drawn attention to a non-enzymatic browning reaction in which carbohydrate degradation products may condense with protein. This type of reaction appears to be favoured by the presence of water (e.g. a high saliva content) and drying at high temperature. The samples used in this study were dried at 75°C and this type of reaction could have occurred in a number of samples which showed browning. It is therefore possible that this could have had some effect on the chemical composition of the fistula samples.

The results obtained in this study suggest that contamination of oesophageal fistula samples with rumen ingesta does occur, even though relatively short collection periods were used. The effect of this contamination on the chemical composition of the sampled feed appears to be relatively small. Contamination by rumen ingesta is, however, not necessarily confined to samples with recoveries in excess of 100%. It is suggested that sample contamination by rumen ingesta could be prevented by placing a small inflatable baloon in the oesophagus below the fistula during collection periods. Although the prestarving of oesophageal fistulated animals prior to sampling would also reduce the possibility of contamination of this nature, Arnold *et al.* (1964) have indicated that this procedure could affect grazing selection on natural pasture.

From this and other studies (cf. van Dyne & Torell, 1964) it is clear that considerable variance occurs in the sampling performance of oesophageal fistulated animals. Samping errors due to animals which for various reasons may be "poor" samplers could be minimized by performance testing of oesophageal fistulated animals both prior to and during the course of diet sampling experiments.

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