

Comparison of mean retention time (MRT) of markers in the reticulorumen (RR) estimated by modelling their faecal excretion curves or by an algebraic method, in sheep

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Compartmental analysis of marker excretion in the faeces is now widely used to obtain estimates of retention time of digesta in various segments of the gastrointestinal tract of ruminants. In this trial we compared MRT_{RR} obtained with the more commonly used models : Grovum et Williams (1973, Br J Nutr, 30, 231-240) (Gw), Ellis *et al* (1979, Fed Proc, 38, 2702-2706) (EI) and Dhanoa *et al* (1985, Br J Nutr, 53, 663-671) (Dh), to those obtained with an algebraic method (Thielemans *et al*, 1978, Ann Biol Biochim Biophys, 18, 237-247) (Ref) considered as the reference one but requiring surgically fistulated animals.

Four Texel wethers surgically fitted with rumen and duodenal cannulae were fed a mixture of chopped and ground pelleted orchardgrass hay in the ratio 90/10, 50/50, 30/70, 10/90 according to a 4x4 latin square design, delivered in 8 equal meals (1200 g DM/day). Pulse doses of 18 µCi ¹⁷⁰Tm labelled chopped hay, 18 µCi ¹⁶⁹Yb ground hay and 40 µCi ⁵¹Cr-EDTA were delivered orally to animals prior to duodenal sampling (20 samples distributed over 6 days) and total faecal collection (7 days). Then, abomasal dose of markers (6 µCi ¹⁶⁹Yb labelled duodenal particles and 8 µCi ⁵¹Cr-EDTA) were injected via the rumen

cannula through the reticulo-omasal orifice prior to duodenal sampling (9 samples distributed over 1 day). ¹⁷⁰Tm, ¹⁶⁹Yb and ⁵¹Cr counts were performed simultaneously on fresh samples using a gamma spectrophotometer. MRT between dosing site (mouth or abomasum) and duodenum was obtained from duodenal markers excretion curves using equation developed by Thielemans *et al* (1978). MRT_{RR} used as reference was calculated by subtracting MRT in whole stomach from MRT in abomasum. Faecal excretion curves were fitted for all markers to the previous cited models, Gw, EI, Dh. MRT_{RR} estimated by each model was compared to the reference. Differences between MRT estimations and corresponding reference values were analysed by the GLM and MEANS procedures of SAS (1985).

MRT_{RR} values estimated by modelling and algebraic methods were close. Markers (digesta phases) had an effect on accuracy of MRT_{RR} estimations with the models. The particulate (Tm, Yb) phase MRT_{RR} calculated using Dh modelling procedure were statistically similar to those calculated with the algebraic method, whilst this was so only for liquid (Cr) when Gw and EI models are used.

		Tm	Yb	Cr
Method :	Ref	27.9	21.9	15.7
	Gw	24.6	20.0	16.6
	EI	23.1	19.4	16.7
	Dh	26.5	23.2	18.0
Difference :	Gw - Ref	-3.35 ^b (0.78)	-1.93 ^{ab} (0.65)	0.90 ^{a*} (0.46)
	EI - Ref	-4.83 ^c (0.85)	-2.49 ^b (1.04)	0.93 ^{a*} (0.55)
	Dh - Ref	-1.41 ^{b*} (1.00)	1.30 ^{a*} (0.48)	2.24 ^a (0.57)

Results are expressed in hours (n = 16).

a, b, c : significant differences between means (P<0.05) ; horizontal comparison.

* : differences not significantly different from zero (P<0.05).

() : standard error.