

Fluid dynamics and particle transit in the digestive tract of dairy cows fed maize silage. M Mambrini, JL Peyraud (INRA, Station de Recherches sur la Vache Laitière, Saint-Gilles, 35590 L'Hermitage, France)

The aim of this study was to describe the transit of fluids and particles in the digestive tract of dairy cows fed a 65% maize silage diet.

The rumen liquid turnover and its reciprocal, the mean retention time (MRTrL), were measured by the dilution of PEG dosed into the rumen of 10 fistulated cows. A meal of forage (F) and concentrate (C), labelled respectively with ytterbium and europium, was also given. Total mean retention times (TMRT) of liquid, F and C were calculated from the quantities of marker excreted in the faeces collected for 8 d. Faecal concentrations of PEG were fitted to different models (Dhanao *et al*, 1985; Quiroz *et al*, 1988). The logarithms of marker faecal concentrations were also plotted against time to obtain the rate (k) of their decline. Delay was the time of the first appearance of the marker in the faeces.

Fluid TMRT (22.7 h) was much lower than particle TMRT (respectively 55.9 and 40.5 h for F and C). Among all the tested models, the 1-compartment gamma 2 age-dependent model fitted PEG faecal data best (RSD = 0.93 g/kg

fresh matter excreted); estimations of TMRT were accurate (21.0 h) but compartmental retention time (12.5 h) was higher than and not correlated with MRTrL (9.5 h). The time 1/k (10.5 h) was equal to and correlated with MRTrL ($r = 0.89$). Thus, the passage of fluids in the digestive tract could be described by a mixing compartment representing the rumen and a post-ruminal transit time (12.6 h) which was split into a delay (10.1 h) and a residual time (2.4 h).

The time 1/k of F (27.7 h) and C (23.8 h), assumed to be the retention time of small particles in the rumen, was higher than and partially related to fluid 1/k ($r = 0.52$ and 0.78 respectively for F and C). The difference (TMRT - 1/k), which represents the post-ruminal transit for the liquids, was higher for F (28.1 h) and for C (17.9 h) than for fluids. Thus, for particles, this difference partly reflects reticulo-rumen processes because liquids and solids have the same transit time in the intestines (Mambrini and Peyraud, 1990).

References

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