



HAL
open science

Estimation of the dynamics of rumen water during the meal in sheep fed lucerne hay ad libitum

René Baumont, M Jailler, J Jamot

► **To cite this version:**

René Baumont, M Jailler, J Jamot. Estimation of the dynamics of rumen water during the meal in sheep fed lucerne hay ad libitum. *Annales de zootechnie*, 1993, 42 (2), pp.157-157. hal-00888898

HAL Id: hal-00888898

<https://hal.science/hal-00888898>

Submitted on 11 May 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Estimation of the dynamics of rumen water during the meal in sheep fed lucerne hay *ad libitum*

R Baumont, M Jailler, J Jamot

INRA, centre de Clermont-Ferrand/Theix, unité Ingestion, station de recherches sur la Nutrition des herbivores, 63122 Saint-Genès-Champagnelle, France

Fitting the dilution curve of a liquid marker to an exponential model enables the volume of liquid in the rumen to be estimated with its turnover rate under steady-state conditions (constant volume) (Warner and Stacy, 1968). However, these conditions are not satisfied when animals are fed once or twice a day. We propose a mechanistic interpretation of the dilution curve of a liquid marker during the meal when rumen volume increases.

Four rumen-fistulated wethers had free access to lucerne hay for 6 h per day. They were dosed with 300 ml Cr-EDTA 2 h before feeding and rumen fluid was continuously sampled over an 8-h period to measure Cr concentration (C) every 15 min. Feed intake, water consumption and rumen motility were simultaneously recorded. During the following 2 wk the volume of water in the rumen was estimated by manual emptying 0, 2, 4 and 6 h after feeding (Baumont, 1989). Rumen water outflow was assumed to be proportional to motility and water inflow to feed intake.

For a meal lasting from time 0 to T , the liquid volume (V) and the amount of marker in the rumen ($V \cdot C$) varied according to the following equation:

$$V_T = V_0 + (k_1 \cdot FI) - (k_2 \cdot NC) \quad [1]$$

$$V_T \cdot C_T = (V_0 \cdot C_0) - k_2 \cdot \sum_{t=0}^{t=T} NC(t) \cdot C(t) \quad [2]$$

where FI is feed intake and NC the number of contractions. From V_0 , V_T , the intake and motility kinetics, k_1 (net inflow of water in ml/g ingested) and k_2 (outflow in ml/contraction) were calculated (5.22 for k_1

and 6.08 for k_2) and then V and C for each time step (5 min) using equations [1] and [2].

The predicted dilution curves matched the observed curves well (mean of the differences \pm SD = $4.21 \pm 2.92\%$) and the model was able to predict the non-linear increase in rumen volume during the meal (mean of the differences \pm SD = $2.67 \pm 2.78\%$) (fig 1). However during the first h, the lower decrease of C than had been predicted may be related to the absence of water consumption during the first h after feeding. This approach can be useful for mechanistic modelling of rumen function under non steady-state conditions.

Baumont R, (1989) Thèse de Doctorat, INA Paris-Grignon, 159 p

Warner ACI, Stacy DB (1968) *Br J Nutr* 22, 389-410

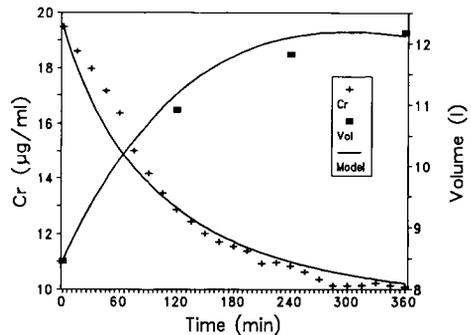


Fig 1. Observed values of Cr concentration in the rumen (Cr) and rumen water volume (Vol), and predictions of the model (—) during a 6-h lucerne hay meal (mean values of 4 sheep).