Summary only

MEASUREMENT OF RUMEN METHANE KINETICS AND ITS APPLICATION TO BLOAT RESEARCH

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The direct measurement of degree of bloat is not possible at present since techniques that measure the accumulation of gas in the rumen have not yet been devised. Since methane constitutes about 25% of rumen gas, the possibility of estimating pool size and turnover time of rumen methane using isotope dilution was examined. Seven sheep which varied greatly in their tendency to bloat were fed 800 g lucerne chaff each day from automatic feeders operating at hourly intervals. Tritium-labelled methane (250 μ Ci) in 25 ml water was rapidly injected into the rumen through a fistula and rumen gas sampled at intervals during the subsequent 1 to 3 h. Specific radioactivity (SR) of methane in the samples was determined with the aid of an infra-red analyser and an ionization chamber coupled to a vibrating reed electrometer.

Turnover time of methane when calculated from the terminal slope of the decay curve of SR ranged from 20 to 120 min with a mean ± SD of 44.0 ± 35.9. That this wide variation reflected differences between animals in degree of bloat or foam content of rumen digesta was confirmed by the effects of anti-bloat oil. After administration of the oil, turnover time decreased to a relatively uniform 18.2 ± 4.4 min.

The kinetics of isotope decay were those of a multiple pool system. Parameters other than the terminal rate constant could not be established accurately by the single injection technique since injection into and sampling from the same pool was not possible.

Valid estimates of methane pool size were possible, however, when constant infusion was used to establish production rate and the subsequent decay of SR from its steady-state value to establish the rate constant. Estimates made in this way on two "bloated" sheep with turnover times of 120 and 101 min indicated pool sizes of 1 183 and 1 398 ml, respectively. The one estimate made where turnover time was rapid (20 min) indicated a pool size of 191 ml.

The data suggest that methane turnover time may provide a useful non-discrete indicator of gas retention, degree of bloat and *in vivo* foam strength. The steady-state conditions required for measuring production rate and pool size detract from the usefulness of these two estimates.