

### Using alkane technology to measure intake of a barley diet by cattle

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This study was to evaluate the use of alkanes administered by intra-ruminal controlled-release devices (CRDs), together with measurement of alkane concentrations in feed and faeces, to estimate intake by cattle of a 75% rolled-barley feedlot ration. Two designs of CRDs with cores containing C32 and C36 alkanes were evaluated sequentially in six Hereford steers (439-522 kg). The steers were individually penned and fed twice-daily; three receiving intakes equivalent to 2.1% and three to 2.4%, of liveweight per day. The CRDs were placed into, and regularly withdrawn for measurement from, the rumen via a fistula. Faecal grab samples were taken daily until three days after removal of the expired CRD. The alkane composition of feed and faeces samples dried at 70°C were analysed by gas chromatography and intakes calculated using published formulae (1).

Travel of the CRD plungers over time was linear for both designs ( $r^2 = 0.998$  and  $0.997$ ), and independent of daily DM intake ( $r^2 = 0.33$  and  $0.32$ ;  $P > 0.05$ ) and level of feeding ( $t = 1.13$  and  $1.61$ ;  $P > 0.05$ ). The rate of plunger travel for both designs was about 10% slower than when they were calibrated in cattle grazing pasture. The barley ration had a low alkane content (C31 = 24; C32 = 4; C33 = 7; C36 = 3 mg/kd DM). Faecal concentration of the dosed even-chain alkanes stabilised 4 to 5 days after insertion of the CRDs and concentrations averaged over days 5 to expiration of the CRDs were used for calculating intakes. The day following expiration of the CRD cores faecal levels of dosed alkanes began to decline markedly. This feature could perhaps be used to confirm expiration of CRDs in cattle not fitted with rumen fistula.

With no allowance for completeness of recovery of alkanes in faeces, actual intakes calculated using the C31:32 alkane pair were grossly underestimated. Recovery of alkanes was calculated as  $(1 - \text{DMD}) \times ([\text{faecal alkane}] / [\text{feed alkane}])$ , with the dosed alkane added to the concentration even-chain alkane in feed, and an in vitro estimate of 77% used for DMD (DM digestibility). Recoveries were: C31 = 69 and 53%; C32 = 93 and 94% and C36 = 88 and 89% in the first and second trial. After adjusting faecal alkane concentrations for these recoveries, estimated intakes equalled actual intake. Intakes estimated from the dose of C36 and using a recovery of C36 = 95% (1) were 96 and 98% of actual, and equal to actual intakes if the lower apparent recoveries of C36 were used. Estimates of intake had cv's of up to 11%.

Alkanes administered by CRDs can be used to measure intake of a barley ration. Intake might be underestimated if faecal concentration of alkanes is not adjusted for apparent differences in recoveries observed with this high grain/low alkane content diet. These differences in recoveries were greater than previously reported (1). We thank M. Reed and M. Beattie for assistance with animal handling, and A. Hendry and R. Hegarty for alkane analyses.

1. Dove H, Mayes RW. The use of plant waxes as marker substances in studies of the nutrition of herbivores: a review. *Aust J Agric Res* 1991;42:913-52.