

# Intra-ruminal concentrations of SF<sub>6</sub> from high release rate permeation tubes

J.P. Goopy<sup>1</sup>, R.S. Hegarty<sup>2</sup> and R.T. Woodgate<sup>2</sup>

<sup>1</sup>School of Rural Science and Agriculture, Animal Science, University of New England, Armidale NSW 2351

<sup>2</sup>NSW Agriculture Beef Industry Centre, University of New England, Armidale NSW 2351 jgoopy@pobox.une.edu.au

Sulphur hexafluoride (SF<sub>6</sub>) released from permeation tubes is used as a tracer gas for the estimation of ruminal methane emissions and (e.g. Ulyatt *et al.* 2002) there is usually a wait of seven days or longer after tube insertion to allow intra-ruminal SF<sub>6</sub> to plateau prior to sampling. Our theoretical calculations, however, suggested that intra-ruminal SF<sub>6</sub> would plateau within 2–3 h of permeation tube placement. Because permeation tubes being developed (Hegarty and Woodgate 2003) have release rates ~100 times higher than those used in previous studies they run for shorter periods, and the time available for calibration and achieving plateau is critical. Permeation tubes releasing an average of 170 mg SF<sub>6</sub>/d (Hegarty and Woodgate 2003) were placed via rumen cannulae into two cows. Rumen gas was regularly sampled (900 ml) through the rumen cannulae over a 5 d period, collected in Tedlar gas sampling bags and immediately analysed for CH<sub>4</sub> and SF<sub>6</sub> concentrations.

No SF<sub>6</sub> was detectable in intra-ruminal gas prior to insertion of the capsules. After insertion, SF<sub>6</sub> concentration rose quickly to be close to a plateau value by 2.5 h (Figure 1a). Intra-ruminal CH<sub>4</sub> ranged from

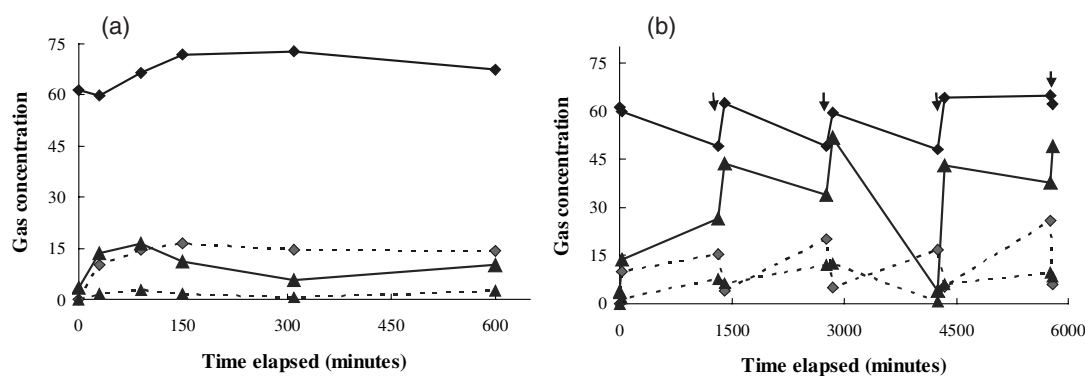
48,000 to 74,500 µl/l in cow V31 and from 3,600 to 49,000 µl/l in cow V14; SF<sub>6</sub> was present in the range of 4 to 26 µl/l in V31 and from 0.8 to 19.1 µl/l in V14. The ratio of SF<sub>6</sub> to CH<sub>4</sub> present was similar between animals. CH<sub>4</sub> generally increased post-feeding, whilst SF<sub>6</sub> fell contemporaneously (Figure 1b). The results of this trial indicate that intra-ruminal SF<sub>6</sub> rises quickly after capsule placement to peak within 2–3 h. Thus, delaying measurements for up to a week after placement is not necessary. It may be concluded that despite considerable differences in SF<sub>6</sub> intra-ruminal concentration between cows, it seems unlikely that it will rise above 40 µl/l at the release rate described.

Hegarty, R.S., Woodgate, R. and Clark, D.A. (2003).

Performance of high-flow permeation tubes releasing SF<sub>6</sub>. *Recent Advances in Animal Nutrition in Australia* 14, 19A.

Ulyatt, M.J., Lassey, K.R., Shelton, I.D. and Walker, C.F.

(2002). Seasonal variation in methane emission from dairy cows and breeding ewes grazing ryegrass/white clover pasture in New Zealand. *New Zealand Journal of Agricultural Research* 45, 217–226.



**Figure 1** Intra-ruminal concentration of CH<sub>4</sub> (m/l; —) and SF<sub>6</sub> (µl/l; ....) in cows V31 (◆) and V14 (▲) in the first 10 h (a) and over a 5 day period (b) following insertion of permeation tubes (arrows indicate time of feeding).