In vitro ruminal VFA production is unaffected by the presence of sulphur hexafluoride

J.P. Goopy[1], S.H. Bird[1], R.S. Hegarty[2] and J.V. Nolan[1]

[1]School of Rural Science and Agriculture, Animal Science, University of New England, Armidale NSW 2351
[2]NSW Agriculture Beef Industry Centre, University of New England, Armidale NSW 2351 jgoopy@pobox.une.edu.au

Since first proposed by Johnson *et al.* (1994), the sulphur hexafluoride (SF_6) tracer technique has been used to quantify ruminal methane emissions from both cattle and sheep. To make the SF_6 technique more robust, permeation tubes with higher release rates have been developed (Hegarty and Woodgate 2003). Although SF_6 is thought to be an inert and non–toxic marker gas, the higher release rates from the new capsules could invalidate this method of determining methane production if there is any effect on microbial metabolism. The intra–ruminal concentration of SF_6 after inserting capsules releasing 100–200 mg/d was from 1–35 µl/l (Goopy *et al*. 2003). A study was made to determine whether SF_6 had any effect on microbial VFA production in the range of 1–100 µl/l.

A rumen liquor sample (2 litres) was obtained from an Angus heifer fitted with a rumen cannula and the contents were strained and used in a 3 h *in vitro* fermentation based on that of Bird *et al.* (1999). Six levels of SF_6 (0, 0.5, 1, 10, 20 and 100 µl/l) were established in the head space of the fermentation flasks.

Total VFA production did not differ (P>0.05) between any of the treatments (Table 1), and all treatments produced similar percentages of acetate, propionate and butyrate in the total VFA. The results of this trial indicate that concentrations of SF_6 up to 100 µl/l in the headspace gas do not have detectable effects on rumen microbial metabolism. It can be concluded that intra–ruminal permeation tubes releasing up to 200mg SF_6/d will not adversely affect rumen microbial function.

Bird, S.H., Rowe, J.B., Choct, M., Stachiw, S., Tyler, P. and Thompson, R.D. (1999). *In vitro* fermentation of grain and enzymatic digestion of cereal starch. *Recent Advances in Animal Nutrition in Australia* 12, 53–59.

Goopy, J.P., Hegarty, R.S. and Woodgate R. (2003). Intra–ruminal concentration of SF_6 from high release rate permeation tubes. *Recent Advances in Animal Nutrition in Australia* 14, 17A.

Hegarty, R.S., Woodgate, R. and Clark, D.A. (2003). Performance of high–flow permeation releasing SF_6. *Recent Advances in Animal Nutrition in Australia* 14, 19A.

Johnson, K., Huyler, M., Westberg, H., Lamb, B. and Zimmerman, P. (1994). Measurement of methane emissions from ruminant livestock using a SF_6 tracer technique. *Environmental Science and Technology* 28, 359–62.

Table 1 VFA production *in vitro* in the presence of increasing concentrations of SF_6.

SF6 µl/l	Acetic acid %	Propionic Acid %	Butyric Acid %	Total VFA (mM/l)
0	62.8	22.4	13.6	47.8
0.5	62.5	22.7	13.7	48.7
1	62.1	22.5	14.1	47.0
10	61.9	22.6	14.2	46.1
20	62.3	22.6	13.9	47.5
100	62.5	22.6	13.9	47.6
Mean	62.4	22.6	13.9	47.4
S.D.	*0.364*	*0.239*	*0.336*	*1.692*