DIETARY MANIPULATION OF METHANE EMISSION IN SHEEP

A. S. CHAUDHRY[A], J. TAKAHASHI[B] and B. A.YOUNG[A]

[A] Department of Animal Production, University of Queensland at Gatton, Qld 4345
[B] Present address: Dept. Animal Science, Obihiro University of Agric. & Vet. Medicine, Obihiro, Japan 080

Nutritional management of ruminants may help reduce methane emission and minimize wastage of nutrients and improve the environment. Takahashi *et al.* (1997) reported a 13% reduction in methane emission by sheep on feeding cysteine in addition to a lucerne hay. However, a similar reduction might also be achieved by altering diet composition. This study examined the effect of changing dietary ratios of soluble carbohydrates (SC) and neutral detergent fibre (NDF) on methane emission and oxygen consumption in wethers. The effect of two levels of intake was also studied.

Four Merino wethers with a mean (± s.d.) liveweight of 41.4±1.4 kg were housed individually in cages equipped with ventilated respiratory gas collection hoods. Two isonitrogenous (207g CP/kg DM) and isoenergetic (10 MJ ME/kg DM) diets containing SC and NDF at two ratios (1:2, High SC, and 1:3, Low SC) were prepared by mixing chopped barley straw, wheat, soybean meal, molasses and a vitamin-mineral premix. Each diet was then fed to the wethers at two levels, 1.6 and 3.2% of liveweight (LW), in a 4x4 latin square experiment with a 2x2 factorial arrangement. Methane emission and oxygen intake were automatically monitored from 1 hour before to 7 hours after morning feed during each test. The data on both methane emission and oxygen consumption were expressed as per kg metabolic weight ($W^{0.75}$, MW) and as per kg feed DM before their statistical analysis. The results are presented in Table 1.

Table 1. Mean (± s.e.) methane emission and oxygen consumption by wethers fed different amounts of soluble carbohydrates (SC) and neutral detergent fibre (NDF)

SC:NDF ratios	High SC		Low SC	
Level of intake (% LW)	1.6	3.2	1.6	3.2
Methane emission				
mL /minute /kg MW	0.91 ± 0.06	1.24 ± 0.10	0.79 ± 0.09	1.37 ± 0.1
L /kg feed DM	21.5 ± 1.5	16.2 ± 1.2	18.8 ± 2.3	17.7 ± 0.8
Oxygen consumption				
mL /minute/ kg MW	17 ± 0.9	23 ± 1.2	13 ± 1.1	18 ± 1.2
L /kg feed DM	402 ± 21	294 ± 15	303 ± 30	232 ± 16

Both methane emission and oxygen consumption per kg MW increased ($P<0.05$) with increase in food intake. In contrast, both methane emission ($P>0.05$) and oxygen consumption ($P<0.05$) per kg high SC feed DM decreased with increase in food intake by wethers. Armstrong (1964) reported a similar decrease in methane emission as a proportion of gross energy in response to increase in grass intake by sheep. While the main effect of SC:NDF ratio was not significant ($P>0.05$) for methane emission, it was significant for oxygen consumption ($P<0.05$) which increased at high SC. There was decrease in methane emission per kg feed DM of about 25% (Table 1) in response to extra feed containing high SC compared with only a 6% reduction in response to an increased intake of feed containing low SC by sheep. It was possible to modify methane emission and consequently the energy balance in wethers by simple dietary manipulations. Further studies should explore a range of diets to modify methane emissions and minimize the loss of dietary energy in ruminants.

ARMSTRONG, D.G. (1964). *J. Agric. Sci. Camb.* **62**, 399-416.
TAKAHASHI, J., CHAUDHRY, A.S., BENEKE, G., SUHUBDY and YOUNG, B.A. 1997. *Sci. Tot. Envir.* **204**, 117-123.