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# The effect of triiodothyronine on mean retention time of rumen digesta and methane production in sheep

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## SUMMARY

Global warming has recently become an important issue throughout the world and one of the major known contributors to this phenomenon is methane from agricultural ruminant livestock production (IPCC 2007). The mean retention time (MRT) of rumen contents in ruminants is positively correlated with the amount of methane produced by the microbial methanogens it contains (Pinares-Patiño *et al.* 2003). Endocrine factors may affect MRT via their effects on rumen contractions, which determine the retention time of feed particles within the forestomach (Bueno *et al.* 1972, Baile *et al.* 1986, Reid *et al.* 1988, Reid *et al.* 1991, Groenewald 1994). It was hypothesised that the thyroid hormone, triiodothyronine (T<sub>3</sub>), the level of which is elevated during cold conditions and is known to influence metabolic rate, will modify reticulorumen and reticulo-omasal orifice contractions, reducing MRT and consequently, the amount of methane produced and emitted.

Ten 3-year-old wethers will be penned individually in temperature-controlled rooms at 20°C and fed a lucerne/wheat chaff ration at 1.2 × maintenance. Five animals will be randomly allocated to each of two groups: one group will receive daily intramuscular injections of T<sub>3</sub> (7 µg/kg) and one group will receive saline injections. On completion of analysis, the saline group will receive T<sub>3</sub> and vice versa and measurements will be repeated.

Methane emissions will be analysed and MRT will be measured using non-digestible markers. Urine samples will be analysed for concentrations of purine derivatives and nitrogen and rumen samples will be analysed for rumen pH, volatile fatty acid levels and numbers of protozoa. Daily blood samples will be collected to assess T<sub>3</sub> titres and oxygen consumption will be monitored for changes in metabolic rate.

If the effect of T<sub>3</sub> on MRT and methane yield is significant, it may be possible to develop a biological marker for high and low methane-yielding ruminants.

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