Methane emissions and mitigation technologies in cattle, sheep and red deer

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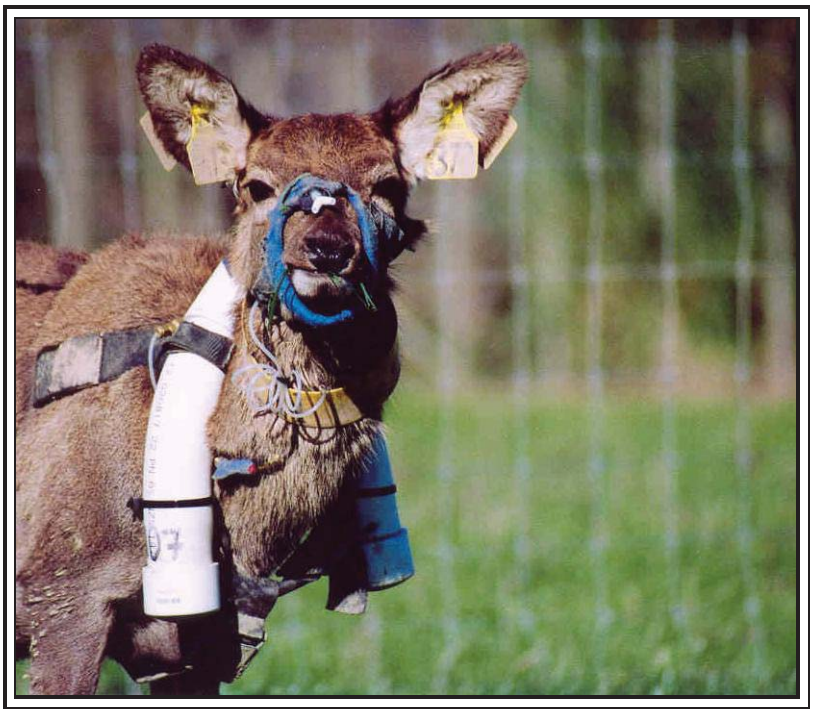

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ABSTRACT

Enteric fermentation of ingested feed by ruminant livestock is an important source of methane (CH_4), a potent greenhouse gas (GHG). Ruminant CH_4 emissions contribute approximately 31% of New Zealand's total GHG inventory; therefore reducing CH_4 emissions from ruminant livestock is a national priority.

The aims of this research were to investigate the effectiveness of potential mitigation technologies on the CH_4 emissions in sheep. This included the supplementation of monensin and coconut oil, individually or in combination, and the feeding of chicory as an alternative forage to perennial ryegrass-based pasture (pasture). The influence of ruminant age (grazing red deer) and ruminant species (housed cattle, sheep and red deer) on CH_4 yield were also explored.

This research showed that the supplementation of monensin to sheep may provide reductions in CH_4 yield (g CH_4/kg dry matter intake, DMI) of up to 30%, but this was not consistent between experiments. Sheep fed chicory yielded less CH_4 (17%) compared with sheep fed pasture, which was suggested to be due to faster degradation rates of chicory, leading to the increased outflow rate of digesta from the rumen; this theory needs to be tested. Neither, the supplementation of coconut oil or the combination of mitigation technologies resulted in a significant reduction in CH_4 yield. Nevertheless, as the power to detect a significant difference between treatments was reduced, due to the high variability of estimated CH_4 production, it is recommended that the effects of combined mitigation technologies be retested.

Methane yield was influenced by deer age, but only at 4.5 months of age as CH_4 yields of deer aged 6.5 to 11.5 months did not differ and may be an artefact of the method used to estimate DMI. Mean differences of CH_4 yield (up to 32%) between ruminant species was found when animals were offered the same diet and constant feeding levels; cattle > sheep > deer. This study indicates that the use of a single ruminant species to model potential CH_4 mitigation technologies may not represent all target populations due to differences of age or species found in this study. Research is required to confirm if differences between ruminant species persist when animals are fed fresh forages and to determine if responses to potential mitigation technologies are similar with age or between ruminant species.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES