

Effects of Rumen Protozoa and Nitrate on Fermentation and Methane Production

Authors : S. H. Nguyen, L. Li, R. S. Hegarty

Abstract : Two experiments were conducted assessing the effects of presence or absence of rumen protozoa and dietary nitrate addition on rumen fermentation characteristics and methane production in Brahman heifers. The first experiment assessed changes in rumen fermentation pattern and in-vitro methane production post-refaunation and the second experiment investigated whether addition of nitrate to the incubation would give rise to methane mitigation additional to that contributed by defaunation. Ten Brahman heifers were progressively adapted to a diet containing coconut oil distillate 4.5% (COD) for 18 d and then all heifers were defaunated using sodium 1-(2-sulfonatoxyethoxy) dodecane (Empicol). After 15 d, the heifers were given a second dose of Empicol. Fifteen days after the second dosing, all heifers were allocated to defaunated or refaunated groups by stratified randomisation. On d 48, an oral dose of rumen fluid collected from unrelated faunated cattle was used to inoculate 5 heifers and form a refaunated group so that the effects of re-establishment of protozoa on fermentation characteristics could be investigated. Samples of rumen fluid collected from each animal using oesophageal intubation before feeding on d 48, 55, 62 and 69 were incubated for 23h in-vitro (experiment 1). On day 82, 2% of NO₃ (as NaNO₃) was included in in-vitro incubations (experiment 2) to test for additivity of NO₃ and absence of protozoa effects on fermentation and methane production. It was concluded that increasing protozoal numbers were associated with increased methane production, with methane production rate significantly higher from refaunated heifers than from defaunated heifers 7, 14 and 21 d after refaunation. Concentration and proportions of major VFA, however, were not affected by protozoal treatments. There is scope for further reducing methane output through combining defaunation and dietary nitrate as the addition of nitrate in the defaunated heifers resulted in 86% reduction in methane production in-vitro.

Keywords : defaunation, nitrate, fermentation, methane production

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