

Effects of naturally-produced lovastatin on feed digestibility, rumen fermentation, microbiota and methane emissions in goats over a 12-week treatment period

ABSTRACT

Twenty male Saanen goats were randomly assigned to four levels of lovastatin supplementation and used to determine the optimal dosage and sustainability of naturally produced lovastatin from fermentation of palm kernel cake (PKC) with *Aspergillus terreus* on enteric methane (CH₄) mitigation. The effects on ruminal microbiota, rumen fermentation, feed digestibility and health of animal were determined over three measuring periods (4-, 8- and 12-weeks) and the accumulation of lovastatin in tissues was determined at the end of the experiment. The diets contained 50% rice straw, 22.8% concentrates and 27.2% of various proportions of untreated or treated PKC to achieve the target daily intake level of 0 (Control), 2, 4 or 6 mg lovastatin/kg body weight (BW). Enteric CH₄ emissions per dry matter intake (DMI), decreased significantly ($P < 0.05$) and equivalent to 11% and 20.4%, respectively, for the 2 and 4 mg/kg BW groups as compared to the Control. No further decrease in CH₄ emission thereafter with higher lovastatin supplementation. Lovastatin had no effect on feed digestibility and minor effect on rumen microbiota, and specifically did not reduce the populations of total methanogens and Methanobacteriales (responsible for CH₄ production). Similarly, lovastatin had little effect on rumen fermentation characteristics except that the proportion of propionate increased, which led to a decreasing trend ($P < 0.08$) in acetic: propionate ratio with increasing dosage of lovastatin. This suggests a shift in rumen fermentation pathway to favor propionate production which serves as H⁺ sink, partly explaining the observed CH₄ reduction. No adverse physiological effects were noted in the animals except that treated PKC (containing lovastatin) was less palatable at the highest inclusion level. Lovastatin residues were detected in tissues of goats fed 6 mg lovastatin/kg BW at between 0.01 to 0.03 µg/g, which are very low.