Does Basal Diet Composition Impact the Methane Mitigation Potential of 3-Nitrooxypropanol in Dairy Cattle?

Sanne van Gastelen[1]*, Jan Dijkstra*[2]*, Sven Alferink*[2]*, Arie Klop*[1]*, Nicola Walker*[3]*, and André Bannink*[1]

[1]Wageningen Livestock Research, Wageningen University & Research, the Netherlands

[2]Animal Nutrition Group, Wageningen University & Research, the Netherlands

[3]DSM Nutritional Products, Basel, Switzerland

The objective was to determine whether the methane mitigation potential of 3-nitrooxypropanol (**3-NOP**) in dairy cows was affected by basal diet composition. Eight rumen-fistulated, multiparous Holstein-Friesian dairy cows were assigned to a double 4 × 4 Latin square design. The four treatments were (on DM basis) a grass silage-based diet (**GS**; 67% grass silage and 33% concentrate) and a corn silage-based diet (**CS**; 13% grass silage, 54% corn silage, and 33% concentrate) supplemented with a placebo (**NOP0**) or 80 mg 3-NOP/kg DM (**NOP80**). Each experimental period consisted of 14 d adaptation in a free-stall barn followed by 4 d of measurements in climate respiration chambers. On the last 2 d of adaptation, rumen fluid was collected 1 h before, and 1, 2, 3, 4, and 6 h after morning feeding. Rumen pH was recorded at 1-min intervals using indwelling pH loggers during the respiration chamber period. NOP80 decreased (P = 0.038) DM intake (**DMI**) with 1.0 kg/d, both with GS and CS. NOP80 did not affect milk yield and composition (P > 0.100). Ruminal pH increased (P = 0.036) and ruminal acetate to propionate ratio decreased (P = 0.012) with NOP80 both with GS and CS. Methane yield (g/kg DMI) decreased (P = 0.002) with NOP80 for both GS and CS, but the decrease in methane yield was numerically smaller for GS (-12.6%) compared with CS (-24.2%). A similar pattern was observed for methane intensity (g/kg energy corrected milk), which decreased (P < 0.001) with NOP80 for both GS and CS, but the decrease was numerically smaller for GS (-14.6%) compared with CS (-24.7%). In conclusion, 3-NOP effectively decreases methane emissions in dairy cows but potentially to a greater extent with a corn silage-based diet compared with a grass silage-based diet.