

## Naturally occurring compounds in animal urine that may inhibit nitrous oxide emissions from soils.

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In New Zealand, nitrous oxide (N<sub>2</sub>O) production is mostly driven by high nitrogen (N) inputs from urine deposited by grazing animals. The use of nitrogen process inhibitors is one example of a potential N<sub>2</sub>O mitigation option. As such, the efficacy of naturally occurring compounds as potential soil N process inhibitors is being assessed. One potential source of naturally occurring inhibitors is brassicas. Brassica crops, such as swedes and kale, are high in glucosinolates (GLS) whose hydrolysis products (e.g. isothiocyanates, thiocyanates and nitriles) have been shown to affect soil N cycling and hence could inhibit N<sub>2</sub>O emissions. These hydrolysis products may be excreted in the urine of animals that consume brassicas and so may provide a practical forage-based tool for mitigating N<sub>2</sub>O emissions from urine patches.

The efficacy of glucosinolate hydrolysis products for reducing N<sub>2</sub>O production and their impact on soil N transformations were assessed under both laboratory and field conditions. Initially, a temperature controlled laboratory incubation was conducted using a Brunwood soil with urea as the N source (600 µg/g soil). Results indicate that some of the GLS hydrolysis products inhibited the nitrification process, reducing N<sub>2</sub>O emissions by up to 50%. The 3 most promising compounds, along with DCD, were tested on Horotiu and Te Kowhai soils in the field. Urine (600 kg N/ha) and potential inhibitors were applied in early June 2016. The field studies had variable results with the Te Kowhai soil showing no effect of these compounds on N<sub>2</sub>O emissions, whereas results indicate 2 compounds (phenylethyl isothiocyanate and pentene nitrile) reduced N<sub>2</sub>O emissions by up to 50% on the Horotiu. If these compounds are confirmed as affecting nitrogen cycling the practicality of applying these on farm needs to be determined.