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**Effect of application times of urease inhibitor (Agrotain®)  
on NH<sub>3</sub> emissions from urine patches**

A thesis presented in partial fulfilment of the requirements for the degree  
of

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## Abstract

In grazed pastures about 80% of urine nitrogen (N) in the form of urea is rapidly hydrolysed and is subjected to ammonia ( $\text{NH}_3$ ) losses. The use of urease inhibitors (UI) has been used as a mitigation tool to decrease the rate of  $\text{NH}_3$  volatilization from fertilizer urea and animal urine. In previous New Zealand trials the UI effect in reducing  $\text{NH}_3$  emissions from urine has been measured by applying urine mixed with the urease inhibitor to the pasture soil thus increasing the chance to better inhibit the urease enzyme. However, these trials do not represent a realistic grazing scenario where only urine is deposited onto the soil.

This current research aimed to identify the best time to spray the Agrotain<sup>®</sup> above soil pasture to reduce  $\text{NH}_3$  losses from urine patches. A field experiment was carried out on dairy farm # 4 at Massey University, Palmerston North, New Zealand. The treatments were: a control (without urine and Agrotain<sup>®</sup>), urine alone at  $530 \text{ kg N ha}^{-1}$  and urine plus Agrotain<sup>®</sup>. The UI was applied to the chambers and soil plots 5 and 3 days prior to urine deposition, on the same day and 1, 3 and 5 after urine deposition in autumn (April 2013).  $\text{NH}_3$  losses were measured using the dynamic chamber method. After the application of the treatments,  $\text{NH}_{3(g)}$  volatilization was determined in the acid traps, and soil mineral N ( $\text{NH}_4^+$ -N and  $\text{NO}_3^-$ -N) and pH were measured from soil plots at different times over a period of 30 days.

The application of the inhibitor prior to urine deposition reduced  $\text{NH}_3$  losses with reductions of 27.6% and 17.5% achieved for UAgr-5 and UAgr-3, respectively; and there was also a reduction in both soil  $\text{NH}_4^+$ -N concentration and soil pH in comparison with urine alone or with the treatments where Agrotain<sup>®</sup> was applied after urine deposition. Application of Agrotain<sup>®</sup> on the same day as urine reduced  $\text{NH}_3$  losses by 9.6% but this was not statistically significant from treatments when Agrotain<sup>®</sup> was applied after urine. The application of Agrotain<sup>®</sup> after urine deposition had no effect on  $\text{NH}_3$  losses from urine.



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