



Environmental  
Protection Authority  
*Te Mana Rauhi Taiao*

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## DISCUSSION DOCUMENT

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# Import and release of strains of *Neotyphodium*; a non-sporulating endophytic fungus

November 2013



## Purpose of this document

1. In November 2013, an application was made to the Environmental Protection Authority (EPA) seeking to import and release non-toxic epichloae endophytes (*Neotyphodium*), for use in cereal crops. This organism is thought to protect the plants from invertebrate pests and drought. The EPA is calling for public submissions on this application. This discussion document is produced by EPA staff to facilitate the submission making process. We discuss the information provided in the application and other readily available sources. This document is aimed at stimulating discussion around the topic and is not intended to be the sole resource used in making a submission. The EPA staff risk assessment is not complete until all submissions have been received and can be incorporated into the risk assessment process.
2. We are interested in all submissions, particularly in relation to matters identified in the following paragraphs. The submission period ends on 24 January 2014.

## Submission process

3. In a submission you can provide information, make comments and raise issues. In this way, you contribute to the EPA decision making process on specific applications. We are particularly interested in hearing from you on the following matters:

- Adverse effects, especially adverse effects not identified in the application<sup>1</sup>; and
- Positive effects, especially positive effects not identified in the application<sup>2</sup>.

Further information on submissions can be found at: [www.epa.govt.nz/about-us/have-your-say](http://www.epa.govt.nz/about-us/have-your-say)

## Application summary

4. Grasslanz Technology Ltd and AgResearch Ltd have applied to the EPA to release strains of fungus (*Neotyphodium* spp.) that do not produce chemicals toxic to mammals but retain the ability to produce compounds that are toxic and/or repellent to invertebrate pasture pests.
5. The applicant states that modern cereals are not naturally infected with epichloae fungi, but that they are found in their wild relatives. They have successfully inoculated cereal grasses, such as wheat, barley, rye corn, Triticale and oats, with non-toxic endophytes to provide non-synthetic chemical pest protection to cereal field crops. They consider that these endophytes enhance cereal resistance to pests and diseases, providing a more reliable and cost-effective feed for livestock industries.
6. The [Application Summary](#) and the full [Application](#) are available on our website [www.epa.govt.nz](http://www.epa.govt.nz).

## Background on *Neotyphodium*

7. *Neotyphodium* is a genus containing species of endosymbiotic<sup>3</sup> fungi. They are asexual, seed-borne symbionts<sup>4</sup> of cool-season grasses, and grow among the cells throughout the above ground tissues of

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<sup>1</sup> Adverse effects can include any risks and costs associated with approving the release of these organisms.

<sup>2</sup> Positive effects can include any benefits associated with approving the release of these organisms.

<sup>3</sup> Any organism that lives within the body or cells of another organism

<sup>4</sup> An organism in a symbiotic relationship. In cases in which a distinction is made between two interacting organisms, the symbiont is the smaller of the two and is always a beneficiary in the relationship, while the larger organism is the host and may or may not derive a benefit.

their hosts. In association with their host plant, *Neotyphodium* endophytes produce at least four different types of chemical compounds; peramine, ergovaline, lolitrem B and lolines. The endophytes gain shelter, nutrition, and dissemination via host seeds, and can contribute an array of host fitness enhancements to the host plant including protection against insects, vertebrate herbivores, and root nematodes; enhancements of drought tolerance and nutrient status; and improved growth particularly of the root. All *Neotyphodium* species can only infect new grass plants by growing into the seeds of their grass hosts, and infecting the growing seedling. They cannot be passed between hosts.

## Adverse effects

8. We are interested in understanding all the possible adverse effects associated with the release of *Neotyphodium*. These effects may include (but are not limited to): impacts on human health, the environment, the economy, and culture and society.

### Assessment of adverse effects

9. Our adverse effects assessment is based on the evidence provided by the applicant, references cited within the application, information available in the public domain and any additional information raised through public engagement.

### Identification of adverse effects

10. The applicant has identified potential adverse effects associated with the release of *Neotyphodium* (see section 6.1 [B. Risks] of the application). These include:

- Potential ability to hybridise with New Zealand native species;
- Potential ability to confer competitive advantage to cereals;
- Potential to introduce new toxic alkaloids not previously described;
- Potential to be more toxic to mammals than endophytes already in New Zealand;
- Potential adverse impacts on native insects; and
- Potential to express different chemicals depending on the host plant.

11. In addition to these risks, the EPA is also interested in any information you may have on adverse effects relating to the displacement of native species within their native habitat, deterioration of natural habitats and the maintenance of New Zealand's inherent genetic diversity.

*Please let us know whether you consider that there are any adverse effects in addition to those identified in the application that we should be aware of.*

When identifying adverse effects it is important that you provide us with details of the effect identified, and the reasons why it occurs. Please consider:

- What other adverse effects are *likely* to be caused by the release of *Neotyphodium*;
- How *likely* these adverse effects are and their potential scale;

- How you think the adverse effects could happen (i.e. the series of events that would have to happen for the adverse effects to occur);
- Options and proposals for managing the adverse effects; and
- Any uncertainty you have on the scope of the information used to assess the adverse effects.

## Positive effects

12. We are interested in understanding all the possible positive effects (or benefits) associated with the release of *Neotyphodium*. These effects may include (but are not limited to): impacts on human health, the environment, the economy, and culture and society.

13. The applicant has identified a series of potential benefits resulting from the release of *Neotyphodium*. These include:

- Stimulation of economic growth in the agricultural sector;
- Reduction in pesticide usage;
- Improved plant performance in drought conditions; and
- Reduced incidence of plant disease.

14. The applicant considers that use of these endophytes in cereal crops is likely to reduce the impact of pests and diseases leading to a reduction in the use of pesticides. They consider that this could reduce the \$22m per year spent by farmers on the purchase and application of fungicides and pesticides.

15. They also consider that these endophytes will reduce the impact of soil borne nematodes on cereal crops, currently an intractable problem with no economically useful options for mitigation.

16. We consider that there may be some economic benefits accrued by pastoralists if they succeed in reducing pesticide applications.

*Please let us know whether you consider that there are additional positive effects that we should be aware of.*

When identifying positive effects, it is important that you provide us with information on:

- Other positive effects *likely* to be caused by the release of *Neotyphodium*;
- How *likely* these positive effects are and their potential scale;
- How you think the positive effects could happen (i.e. the series of events that would have to happen for the positive effects to occur);
- Options and proposals for ensuring the positive effects occur; and
- Any uncertainty you have on the scope of the information used to assess the positive effects.

## Making a submission

17. We are interested in submissions on this application, particularly if you can provide information on adverse or positive effects, regardless of how much detail you are able to put in to it. When the submission period closes, all submissions will be summarised and made available to the decision making

committee. You can also request a hearing if you would like to strengthen your submission in person before the committee.

18. If you have any questions, you can contact the applicant directly, as well as the EPA. The applicant can address any questions you have about the science of the application or the information provided, and the EPA can advise you on how to prepare your submission.

- Applicant contact: John Caradus, email John.Caradus@grasslanz.com or phone 06 351 8001.
- EPA contact: Kate Bromfield email Kate.Bromfield@epa.govt.nz or phone 04 4745460.

### Declaration

This advice was produced by Kate Bromfield, Senior Environmental Risk Advisor to the EPA. All information presented in this report is true and correct to the best of my knowledge.

**18 November 2013**

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Kate Bromfield  
Senior Environmental Risk Advisor  
**Environmental Protection Authority**

Date: