



GE Free New Zealand

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13 October 2026

Re: Reassessment of dsRNA under HSNO sec: 63.

Kia ora,

We request a reassessment of EPA's current designation of double stranded RNA (dsRNA) under section 63 of the Hazardous Substances and New Organisms Act 1996 (HSNO) This reassessment concerns the determination of dsRNA in APP203395 by the EPA.

We have cited recent research that provides further information on the development and inheritable traits of dsRNA applied externally, establishing that the replication and the transfer of genetic elements to subsequent generations of an organism occurs.

In May 2018 the EPA designated dsRNA as non-GMO. As stated in the decision on APP203395 under point 4.7 and 4.9 below –

4.7 “the genes or genetic material of a eukaryotic cell or organism would not be modified following treatment...”

And

4.9 “The committee noted that if there is evidence that sequences derived from RNA molecules have integrated into the genome of a eukaryotic cell or organism or has otherwise become inheritable in progeny in of eukaryotic cells or organisms treated externally applied dsRNA, then in line with section 26 (3) of the Act [HSNO] any determination issued by the Authority can be revoked or reissued....on receipt of further information, by the Authority.”¹

We ask that under the HSNO Act 26 (3), the determination on dsRNA, a nucleic acid, used in biopesticides or in plant and animal protection, is revoked. In light of the further information on the risks and possible adverse genome effects of the heritable dsRNA on the epigenetics of subsequent generations, the status of dsRNA should be reassessed and re-defined as a genetically modified organism.

Information.

The HSNO Act states that a genetically modified organism is –

“...any organism in which any of the genes or other genetic material–

(a) have been modified by in vitro techniques; or

(b) are inherited or otherwise derived, through any number of replications, from any genes or other genetic material which has been modified by in vitro techniques (HSNO sec:2).

¹https://www.epa.govt.nz/assets/FileAPI/hsno-ar/APP203395/APP203395_Decision.-Superceded-June-2021.pdf

A **genetic element**, is –

(a) *heritable material; and*

(b) *any genes, nucleic acids, or other molecules from the organism that can, without human intervention, replicate in a biological system and transfer a character or trait to another organism or to subsequent generations of the organism. (HSNO sec:2).*

Further, Field Tests are in an open environment where birds and insects can come into contact with the pesticide as well as affecting neighbouring properties from spray drift, this will be impossible to clean up. This is especially concerning if there are multiple genetic elements in the formulation being tested. All Such field trials must be publically notified and open for submissions.

A **Field test** states –

field test *means, in relation to an organism, the carrying on of trials on the effects of the organism under conditions similar to those of the environment into which the organism is likely to be released, but from which the organism, or any heritable material arising from it, could be retrieved or destroyed at the end of the trials. (HSNO sec:2).*

To make a dsRNA, biopesticide more stable the RNA interference (RNAi) molecules contained in the formulation may be either coated with a nanoparticle or synthesised using host organisms that have been modified by *in vitro* techniques.

A study by Shaffer (2020)² details a clear framework on the process on how the genetically engineered dsRNA synthesis occurs *in vitro*.

Marre *et al* (2016) found that dsRNA can enter the embryo and silence genes for up to 25 generations.³

In their meta-analysis, Germing *et al* (2025) recorded 219 patents for biopesticides using RNAi-based pest control. The patents included 83 organisms, 31 different insect species, focusing on the orders of Lepidoptera, Hemiptera and Coleoptera, 35 species of fungi and 7 viruses.⁴ The most common mode of action of dsRNA pesticides is to impair development, fertility, energy metabolism, the hormone system, the immune system and the neuronal system.⁵ Such a cocktail of biopesticides in the environment, with little known about any risks from off-target effects or unintended effects on non-target organisms is central to the consideration of the EPA's directive through the purpose and principles of the HSNO Act.

As noted by He *et al.*, (2022) in their research on “RNAi pest control: Production application and the fate of dsRNA”, they point out that field experimentation is lacking and the different production systems using genetically engineered bacteria with *in vivo* production systems are prone to errors and of poor quality, often causing environmental issues.⁶

There are several different types of double stranded ribonucleic acids (dsRNA). In general, these are macro-molecules more often sourced from genetically engineered bacteria for bio-pesticide use.⁷ Studies on RNAi pesticides have shown that gene silencing acquired epigenetically is passed down to subsequent generations.

There is a growing body of evidence that RNAi biopesticides can cause a wide range of deleterious effects that include sterility and death in targeted insects, e.g. fruit fly,⁸ varroa and many more. These could have serious consequences in

² <https://www.rnaissanceag.net/rna-based-pesticides-aim-to-get-around-resistance-problems/>

³ Marré J, Traver EC, Jose AM. Extracellular RNA is transported from one generation to the next in *Caenorhabditis elegans*. Proc Natl Acad Sci U S A. 2016 Nov 1;113(44):12496-12501. doi: 10.1073/pnas.1608959113. Epub 2016 Oct 17. PMID: 27791108; PMCID: PMC5098612.

⁴ <https://link.springer.com/article/10.1186/s12302-025-01052-6>

⁵ <https://www.mdpi.com/2075-4450/16/7/737>

⁶ <https://www.frontiersin.org/journals/bioengineering-and-biotechnology/articles/10.3389/fbioe.2022.1080576/full>

⁷ <https://pmc.ncbi.nlm.nih.gov/articles/PMC9588923/>

⁸ <https://www.nature.com/articles/s41598-017-04431-z>

ecosystems where many species of birds, amphibians and fish have insects in their diet. RNAi technology that causes death and sterility in target organisms is likely to have unintended and unknown risk effects on other organisms in a range of trophic levels.

In addition, the newly legislated Organic Products and Production Act 2023 and secondary legislation of the Organic Standards Regulations 2025, also prohibit laboratory created RNA molecules, as stated in section 12 -

- I. (1)(b) *methods that—*
- i. interfere with the molecular composition of organisms resulting in genetic material being altered in a way that is impractical or impossible to achieve through natural methods:
 - ii. include *the use of material to accelerate the process of cellular internalisation of gene-altering agents*.⁹

and secondary legislation of the Organic Operators 2026, also prohibit laboratory created RNA molecules, as stated in section 1.2 Prohibited procedures, organisms, and products [OS Reg 12]

- 1 (1) *The following technologies must not be used in organic production or processing:*
- a) *recombinant DNA and/or RNA techniques:*
 - b) *micro and macro injection, encapsulation, gene deletion, and gene/chromosome doubling*.¹⁰

Requirements for HSNO field releases are specified in the HSNO Act sec: 53 (d). With the RNA bio-pesticide, there was no consultation with bee keepers in the area who were not part of the trial.¹¹

Dr. Phillip Ball has outlined the role that RNA plays in an open information system and how RNA is an important creator of new molecules that do not need to work from a DNA protein template. Many of these RNA molecules do not code for protein and appear to have other functions in the cell, particularly in the roles of gene silencing and gene regulation.¹² The epigenetic functions that are mediated by dsRNA in a cell that are mediated by dsRNA open up the possibility that new molecules can be created with any number of unintended and unknown off-target effects.

The Official Information Act (OIA) request we filed revealed that there had already been field trials with the dsRNA bio-pesticide vadesca on 200 hives in two locations in New Zealand, one in the North Island and the other in the South Island. This is of great concern as bees frequently fly between hives and forage up to 3-10 km for pollen and nectar. Therefore any dangers from transmission to other organisms could go undetected and cause any number of detrimental off-target effects.¹³

The effects of vadesca on non-target organisms in these field trials cannot be ruled out, and the unintended and unknown effects on the predators of such non-target organisms must also be considered. This is concerning, especially as bees and other pollinators are responsible for the pollination of around 85% of our food and also essential for the pollination of many angiosperm plants.¹⁴

A study by Jarosch and Moritz (2020) found that off-target knockdown unintended effects from dsRNA biopesticides occurred in bees.¹⁵

⁹ <https://www.legislation.govt.nz/secondary-legislation/pco-drafted/2025/197/en/latest/#LMS1510348>

¹⁰ <https://www.mpi.govt.nz/dmsdocument/72548-Organic-Notice-Operators-2026>

¹¹ <https://www.legislation.govt.nz/act/public/1996/30/en/latest/#DLM384054>

¹² https://www.youtube.com/watch?v=tw54LmxR21A&list=PLiToXfcJ2t9baF1ogjz_2lpZyhWN5CSQo

¹³ <https://www.honeyflow.com/blogs/livestreams/how-far-do-bees-fly-220810>

¹⁴ <https://www.farmers.gov/blog/value-birds-and-bees>

¹⁵ <https://hal.science/hal-01003631/document>

It cannot be assumed that dsRNA is inert following ingestion, or that it will always effectively suppress the target organism¹⁶ Information on whether dsRNA biopesticides are inert and simply exist in the cell without having any effect on non-target organisms has been shown to be incorrect.

The studies as described below, show the range of unintended and intended effects on different species of both non-target and target organisms.

Silver et al (2021) found that there was a significant difference between the susceptibility of different Coleoptera species to dsRNA. They found that out of 50 dsRNAs that successfully caused high mortality (>75%) in the red flour beetle (*Tribolium castaneum*), only 6 dsRNAs (12%) caused mortality when fed to the Western Corn Rootworm (*Diabrotica virgifera virgifera*)

The most lethal gene target for the corn rootworm (RpII140-1), showed a 97% mortality rate after 9 days of feeding with dsRNA pesticide. Yet, the RpII140-1 gene ranked 38th in effectiveness for the red flour beetle requiring a more invasive delivery method (injection) over a longer timeline (14 days) to reach a lower mortality rate (90%).

Silver's findings supported the research of Cao et al (2018) on the variation of susceptibility in different species. They found that there was a significant difference between the red flour beetle (*T. castaneum*) and the recalcitrant pea aphid *Acyrtosiphon pisum*¹⁷ in susceptibility to the dsRNA formulation.

A study by Zhang et al (2022) study on the off-target effects of dsRNA reported that wolf spiders feeding on brown planthoppers had silenced genes in their midgut. The same wolf spiders had whole body silencing when they drank guttation exudates from the plants. They concluded

*“Our results demonstrated that rice seedlings could easily take up dsRNA from both topical leaf treatment (32.7 pg/mg in roots) and root soaking (125.2 pg/mg in whole plants). dsRNA was relatively stable in plants, with a half-life of 69.6 h. This led to significant targeted and off-target RNAi in the plant consumers, herbivorous hoppers (59.3–73.8% suppression). These results were consistent with previous reports.”*¹⁸

If adverse effects are measured wrong way (mid gut silencing of wolf spiders feeding on planthoppers) or wrong assay to detect effect (guttation droplets causing off-target whole body silencing in spider), then chronic low-level effects with overall important implications could easily be missed.

The Victoria University approved vadesca research in field trials.¹⁹ Has shown that the dsRNA bio-insecticide vadesca is ingested by the varroa mites from the haemolymph of developing bee pupae. The dsRNA molecule then causes disruption to the reproductive system of varroa mite progeny.

The method of transmission of dsRNA from bees to the varroa mites is through the 6-12 week old nurse bees, who access the bioinsecticide vadesca in a sugar water preparation and feed it to the bee pupae. The parasitic varroa mites feed on the haemolymph of the developing bee pupae.

¹⁶ <https://www.frontiersin.org/journals/genetics/articles/10.3389/fgene.2018.00384/full>

¹⁷ Cao M, Gatehouse JA, Fitches EC. A Systematic Study of RNAi Effects and dsRNA Stability in *Tribolium castaneum* and *Acyrtosiphon pisum*, Following Injection and Ingestion of Analogous dsRNAs. Int J Mol Sci. 2018 Apr 4;19(4):1079. doi: 10.3390/ijms19041079.

¹⁸ Zhang H, Chen J, Gao J, Zhang Q, Liu X, Han Z. New insights into transmission pathways and possible off-target effects of insecticidal dsRNA released by treated plants. Pestic Biochem Physiol. 2022 Nov;188:105281. doi: 10.1016/j.pestbp.2022.105281. Epub 2022 Nov 5. PMID: 36464336.

¹⁹ <https://www.frontiersin.org/journals/insect-science/articles/10.3389/finsc.2026.1814622/full>

Maori *et al* (2019) found that dsRNA added to bee food was transmissible, horizontally transferred between bees, and still intact 14 days after the final feed.²⁰ This is cause for concern, as the main task of the nurse bees is to feed the developing bee pupae, drones and queen.

The Victoria University studies found that the vadesca (Norroa) feeding trial had a small effect on the *Varroa destructor* foundress generation, but a significantly larger effect was seen on the F1 progeny.²¹ It was observed that after taking up vadesca, the expression of the calmodulin gene in varroa mites was transient and waned quickly, but still affected the progeny. It is possible that some of these progeny could go on to reproduce and eventually become resistant to the vadesca treatment. The research only looked at the effects of the dsRNA on varroa for 17 weeks. This narrow observation of one part of the bee life cycle does not provide any information about the effects of vadesca on other life cycle stages or of subsequent generations of bees.²²

As worker bees are sterile the effects of the treatment on their fertility is not an issue. However, the important role of the dsRNA pesticide on the fertility of emergent queens and drones fertility was not researched. Knowledge from such research is essential before any treatment of hives with vadesca goes ahead. Just as the founder mites do not appear to be directly affected by the pesticide, but their progeny are sterile, the same, or other unexpected consequences could occur with queens and drones as off-target effects. Off-target sterilisation of bees would lead to the collapse of colonies.²³

Vadesca is known to target the expression of the calcium-binding protein calmodulin in varroa mites. The mites and bees share a 74% genetic similarity in their total DNA makeup and calmodulin is found in the part of the bee brain that is responsible for learning, memory and olfactory processing.^{24, 25} Off-target RNAi effects *commonly occur in homologous genes that share high sequence identity with the target gene or in long conserved domains*. Any interference with these processes would negatively affect the bee colony and the ability of bees to communicate about food sources and memory associated with areas of foraging.

The varroa mite has already been shown to move around the country. Therefore, should populations of varroa become resistant to Norroa, it will be only a matter of time before infestations of resistance spread across the country. To date, mite reproduction has only been nominally suppressed in F1 progeny for 10 weeks. The number of generations until the appearance of resistant mites could be relatively few.²⁶

Before making the decision to consider the field testing of dsRNA as non-GM, the EPA did not carry out environmental testing. This must now be re-evaluated in light of new research information on dsRNA.

Shaffer *et al* (2020) found that:

*“...though the persistence of the naked dsRNA has low longevity in the environment; however, aided with actin, it has been seen to persist on plant systems.”*²⁷

Han *et al* (2026) found that foliar application of dsRNA encapsulated in nanomaterials enhanced the stability and protection of premature degradation of dsRNA *“markedly extended the duration of gene silencing effects.”*²⁸

²⁰ [https://www.cell.com/cell-reports/fulltext/S2211-1247\(19\)30553-4](https://www.cell.com/cell-reports/fulltext/S2211-1247(19)30553-4)

²¹ <https://scijournals.onlinelibrary.wiley.com/doi/10.1002/ps.8193>

²² <https://scijournals.onlinelibrary.wiley.com/doi/10.1002/ps.70406>

²³ <https://pmc.ncbi.nlm.nih.gov/articles/PMC12963394/>

²⁴ <https://pmc.ncbi.nlm.nih.gov/articles/PMC8171953/>

²⁵ <https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2022.848150/full>

²⁶ <https://pmc.ncbi.nlm.nih.gov/articles/PMC4591231/>

²⁷ <https://www.pnas.org/doi/10.1073/pnas.2024033117>

²⁸ Han, Y. *et al.* (2026) ‘Study on the effects of spraying nanomaterial-encapsulated dsRNA targeting the trehalose-6-phosphate synthase gene on the growth and reproduction of *Nilaparvata lugens*’, *Pesticide Biochemistry and Physiology*, 218, p. 106974. doi:10.1016/j.pestbp.2026.106974.

There is a profound difference between the degradation of naturally occurring naked, unmodified dsRNA and the lipid nanomaterial encapsulation of dsRNA in pesticides. The stable silencing and persistence in organisms and the environment of encapsulated dsRNA nanomaterial must not be confounded with more rapid degradation of naked dsRNA when evaluated.

Research by Parker *et al* (2020) research found that:

*“dsRNA molecules added to soil suspensions undergo adsorption to soil particle surfaces, degradation in solution, and potential uptake by soil microorganisms. The results of this work on dsRNA adsorption and degradation advance a process-based understanding of the fate of dsRNA in soils and will inform ecological risk assessments of emerging dsRNA pesticides.”*²⁹

This observation was supported by Koidou *et al.* (2026), whose research showed that applied dsRNA rapidly associates with soil particles. Therefore, as the bioavailability to soil microorganisms is unknown, overlooking soil particle-bound material requires further investigation on the degradation and formulation dynamics of biopesticides.³⁰

Soil research by Zarrabian and Sherif (2025) considered that dsRNA was “a novel engineered material” and their study of the environmental safety and toxicity of naked and encapsulated novel engineered dsRNA in biopesticides found that

*“Regulatory frameworks, ... require a quantitative assessment of a new pesticide's environmental persistence to evaluate risks to non-target organisms. The ME-dsRNA formulation studied here, as a novel engineered material, lacks this historical data. Its persistence is therefore a primary hazard consideration, as a longer half-life increases the potential for off-target exposure and unintended ecological effects.”*³¹

The possibility of immune-responsive effects and the development of tolerance to dsRNA also exists. Naturally occurring mutations and genetic variation among insects can result in reduced complementarity between dsRNA and the target gene. Likewise, mutation on core RNAi genes might also impact dsRNA processing and transportation.

Mishra *et al.* (2021) have studied the growing cross-resistance to RNAi from foliar/topical pesticide sprays in three beetle species that have economic impacts for farmers in the USA. They found that there was a > 11,100-fold resistance to the dsRNA foliar spray.

A study on Deformed Wing Virus using RNAi bio-pesticide (Smeely *et al.*, 2023) reported that:

*“Overall, our findings show that RNAi is not always successful, and multiple factors including pathogen diversity and transmission route may impact its efficiency.”*³²

Additionally, the off-target effects are not predictable and need to be refined further in order to procure an absolutely robust and smooth machinery (Heinemann, 2019)³³.

A review by Kim and Zhang (2023) on insect sterility from dsRNA pesticides found that the RNAi efficiency has many barriers to the persistence and cellular uptake in the target insects. Their conclusion is as follows

²⁹ <https://pubmed.ncbi.nlm.nih.gov/30681839/>

³⁰ <https://www.sciencedirect.com/science/article/pii/S2589004226018031>

³¹ <https://www.sciencedirect.com/science/article/pii/S0147651325016173?via%3Dihub>

³² <https://data.bioheritage.nz/dataset/so5-invertebrates/resource/2ff09c57-a0c6-439a-9f12-548a9447af7c>

³³ <https://pubmed.ncbi.nlm.nih.gov/31174887/>

*“As RNAi-based technology is being assessed and regulated by regulatory frameworks, it is urgently essential to develop science-based risk assessment procedures for topical RNAi applications within existing plant protection products legislation.”*³⁴

Zhong X., Yu X., Zhang J. *et al* (2025) found that different dsRNA pesticides showed variable effectiveness, and therefore pyramiding or stacking might be needed. As dsRNA is a genomic molecule, its ability to recombine with any other strands of RNA fragments is possible. The consequences of recombination are unknown. Assessments must factor in that these pesticides often contain multiple RNAi pesticide formulations and may have toxic or mutagenic effects on non-target native and introduced flora and fauna.³⁵

A recent study by Perez-Aquez *et al.* (2025) points to the implication for drug resistance in the human fungal pathogen *Mucor circinelloides*. They found that:

*“Epimutations mediated by RNA interference (RNAi) and/or chromatin modifications can confer antifungal drug resistance and may impact virulence traits in fungi. This study demonstrates that RNAi epimutations conferring antifungal drug resistance are trans-generationally inherited in the human fungal pathogen.”*³⁶

These findings could be extrapolated to soil fungal communities and could pose unpredicted risks to plant, human and soil health.

Given that there are other equally effective non-genetic treatments available that are used by beekeepers. Certified organic beekeepers have already found ways to deal with varroa mite infestations, e.g. the use of thymol, formic acid, oxalic acid and hive designs that are more sympathetic to natural bee behaviours.

Thymol, which is currently available on the market, and is derived from the oil of thyme, has been found to be effective against many bee pests, including *Nosema ceranae* and *Varroa destructor*. Research on the use of thymol conducted by Glavinic *et al* (2022) demonstrated its thorough effectiveness. Thymol is a naturally occurring compound and does not negatively affect bees. It also supports the immune system of infected bees. It has been approved for use as a treatment in organic apiaries and careful treatment with thymol does not interfere with natural fertility or sterility, or have any known off-target effects on other insects and organisms.³⁷

Chinkangsadarn *et al* (2024) found that the thymol-based treatment Apiguard showed long-term effectiveness as well as a reduction of varroa infestation by between 98%-100%. They re-applied the thymol every 35 days. Resistance to this treatment has not been recorded to date. As thymol is taken up by the bee, it is brushed on the bottom of the body catching on the hairs and as a result adversely affected the varroa mite attached to the area of the fat body.³⁸

In Summary -

We are calling for a reassessment under HSNO section 63 of the EPA determination in APP203395 regarding double stranded RNA. We have provided new and further information requiring the revoking or reissuing of the status of the dsRNA. As the documentation shows it must be interpreted under HSNO 2A and defined as a genetically modified organism. As stated in the EPA determination clauses

³⁴ Kim, D. S., & Zhang, J. (2023). Strategies to improve the efficiency of RNAi-mediated crop protection for pest control. *Entomologia Generalis*, 43(1), 5.

³⁵ https://www.sciopen.com/local/article_pdf/10.1016/j.cj.2025.05.006.pdf

³⁶ <https://www.nature.com/articles/s41467-025-62572-6>

³⁷ Glavinic, U.; Blagojevic, J.; Ristanic, M.; Stevanovic, J.; Lakic, N.; Mirilovic, M.; Stanimirovic, Z. Use of Thymol in *Nosema ceranae* Control and Health Improvement of Infected Honey Bees. *Insects* **2022**, *13*, 574. <https://pmc.ncbi.nlm.nih.gov/articles/PMC9319372/>

³⁸ <https://indianjournals.com/article/jer-48-4-002>

4.7 “the genes or genetic material of a eukaryotic cell or organism would not be modified following treatment...”

And

4.9 “The committee noted that if there is evidence that sequences derived from RNA molecules have integrated into the genome of a eukaryotic cell or organism or has otherwise become inheritable in progeny in of eukaryotic cells or organisms treated with externally applied dsRNA, then in line with section 26 (3) of the Act [HSNO] any determination issued by the Authority can be revoked or reissued....on receipt of further information, by the Authority.”

Therefore, we request that all RNA biopesticides be considered under the HSNO Act 1996, as products of genetic modification that should be subject to regulatory oversight. As with all outdoor GM trials, ranging from field trials to commercial releases, there should be a requirement for public notification.

All approvals regarding dsRNA pesticides for glasshouse and field testing must be prohibited until legislation on dsRNA is reassessed.

Environmental concerns

- **Open-air experimentation:** Genetically modifying organisms in the open environment makes controlling exposure difficult or even impossible. Entire ecosystems could be affected, and unintended genetic events could be inherited by plants, animals, insects, soil microbes or any other organisms and may persist in the environment for any number of generations.
- **Unintended silencing of genes:** RNAi technologies are widely associated with off-target activity – the silencing of genes that weren’t intended to be silenced, both in target organisms as well as in non-target organisms.
- **Unintended effects of dsRNA:** The toxic effects might not be seen as similar in non-target organisms but have deleterious effects on other functions of the organism.
- **Unintended recombination of dsRNA dicer fragments :** RNAi pesticides with single or pyramidal/multiple formulations could recombine to form new toxic compounds that harm both target and non- target organisms.
- **Effects on non-target organisms:** Interfering RNA targeting a specific pest’s genes may bind to and shut down genes in other organisms as well. This off-target effect may extend beyond closely related species to potentially thousands of different species. Research already demonstrates the potential to harm beneficial insects, including honeybees, and beetles.
- **Entrenching the pesticide treadmill:** There is evidence to suggest that targeted pests, as they have with other pesticides, will rapidly develop resistance to RNAi pesticides.

Human health concerns

- **Inhalation of synthetic interfering RNAs:** Farmers, farmworkers, and rural communities may be exposed to synthetic interfering RNAs via spray drift. The risks pertaining to inhalation exposure are completely unknown and undocumented.
- **Altering crops’ genetic composition:** Unwanted gene silencing could occur in target crops as the result of exposure to RNAi pesticides. This could alter the crops’ genetic composition, such as levels of toxins or allergens, raising safety concerns.
- **Dietary consumption of synthetic interfering RNAs:** Preliminary research suggests that naturally occurring interfering RNAs in our diet play a role in regulating physiological or pathological conditions in our bodies.^{12,13} The possibility exists that synthetic RNAi products may interfere with human gene regulation, giving rise to unforeseen health consequences. Further investigation is needed to fully understand the safety implications arising from the consumption of synthetic interfering RNAs

- **Medical research on interfering RNAs suggesting potential for toxicity:** Research investigating therapeutic uses of interfering RNAs has been hampered by the observation that they can cause an immune reaction in the body, triggering an unwanted inflammatory response.

Under HSNO Act section 63, we call on the EPA to carry out a reassessment on the designation of dsRNA based on the most recent scientific research. We ask that RNAi pesticides be designated as genetically engineered/genetically modified organisms (GMOs). The Purpose, Principles, Precautionary Approach and Treaty of Waitangi (HSNO sec:4-8) must be upheld and dsRNA should be regulated by the government in order to protect human and animal health and the environment.

Consideration of dsRNA biopesticides that confer sterility onto organisms must also be prohibited.

The livelihoods of the agricultural community rely on insects and soil to support plant and animal health. Because biopesticides can cause heritable genetic death and sterilisation and are known for toxic effects, critical species will be threatened. The public must have a say in the use of this class of pesticides. We do not just risk harm to the health of insects, other invertebrates, plants and soil ecosystems, but also potentially to human and animal health.

Ngā mihi

Jon Muller

Secretary GE Free New Zealand