

# GENE EDITING FOR PEST CONTROL

AMY LAITHWAITE (992 WORDS)

Gene editing is the process in which DNA is cut and instead of using existing DNA to repair it, new repair information is used to change the damaged DNA strand. This is done by CRISPR, using a modified system from cutting out viruses in bacteria to precisely edit DNA (Guthrie, 2021)



FIGURE 2

## WHAT ISSUE DOES GENE EDITING ADDRESS?

Used for Pest control purposes in a ‘gene drive’, to spread sterility genes through the population of species such as possums, rats and wasps that predate native species. Since the affected gene targets germline cells, gene drives lead to higher chances the edited gene inherited, in the case of a sterility gene, the population reduces over time (Ladenheim, 2022), Reduced wasp population in New Zealand will decrease the amount of wasp attacks on beehives. Possum eats native plants and birds, also carrier of bovine tuberculosis (Guthrie, 2021)



FIGURE 1

## RECENT DEVELOPMENTS IN GENE EDITING

2021

In April, study in gene editing in flies state that when an edited male fly mates with a non-edited female fly, the female fly lays unfertilised eggs (Kandul N.P., et al, 2021)

2022

In April, New Zealand government to enter into public conversation about changing the restrictive legislation surrounding the development and use of genetic modification.

2022

In May, Crown institute predator free 2050 invested \$6.7 million into research projects in which some of it included research into genetic editing of mice and stoats.

2022

\$300,000 allocated to research into spreading reduced fitness genes in possum to lead to population decline.

## NEWS MEDIA COVERAGE– ARTICLE 1

This media article from RNZ states the New Zealand Government will have a full regulatory review on current laws surrounding genetic modification, therefore having a regulatory innovation impact. Claims were made the laws were stopping primary industries from making innovative leaps. This process will include many public discussion forums, but some argue now, its more about seeing action to reflect the technological advances made. As part of their report, the productivity commission recognizes science has advanced since initial regulations were created two decades ago, however being more open with gene technologies doesn’t need to diminish New Zealand's image of sustainability. In the report, categories to reduce gene editing constraints were listed such as those to make plant traits more favorable, and the edited organisms not standing out to those that are not edited. The Ministry of environment came to the conclusion that edited organisms are of no higher risk than standard- bred organisms. To have a full impact on the potential innovation, the report also suggests relaxing some border quarantine on genetic material used for study (Pelletier, 2022).

## STAKEHOLDER PERSPECTIVE

### TANGATA WHENUA

The perspective of many Maori, from business owners where income is a factor in pest control as well as religious or spiritual Maori is they have an obligation under te ao Maori, to protect insects and reptiles from pests as the whakapapa connects to atua to which deity that forests and birds possess (Hudson., et al 2019). However, more information and education surrounding the gene editing would be required for an informed decision on behalf of all the different iwi and hapu

“Invasive predators are a critical issue to Māori because they threaten taonga species that are fundamental to cultural practices and identity.”

“ ... the other issue I do see is that if some of the genetic techniques were introduced there’s no way to respect different iwi preferences, like if some iwi or hapū are very much opposed to it.”

### GENETICS RESEARCHERS

For the use of gene editing for pest control as it gives a cheaper and a more publicly approved alternative to 1080 poisoning (Dearden., et al 2018). Researchers recognise that in order to reach New Zealand’s goal of predator free by 2050, new pest control technologies will have to be adopted to get the desired outcome.

“Gene drive technologies have the potential to be a remarkably effective and important tool in our efforts to control pests in New Zealand. Indeed, given the Predator-Free 2050 imperative, there are few ideas as persuasive as the ability of gene drives to eradicate pests and predators.”

### MINISTRY OF ENVIRONMENT

Currently the release of genetically edited organisms outside of a laboratory is illegal. Due to current laws about genetically modified organisms (GMO’S) in New Zealand, gene editing isn’t distinguished from genetic modification. To move forward would require the current law to be changed in order for any edited organisms to be released into the wild or be taken outside of a laboratory (Palmer., et al 2022. As of right now, the government his entering into public discussion forums to consider changing legislation.

"Government has long considered that the New Zealand brand and value is best met by maintaining a 'proceed with caution' approach, ... However, we consider it timely to start informed conversations around New Zealand's use of GM technologies."

### PREDATOR FREE 2050

For the theoretical use of gene editing as a form of pest control once the technology is developed. They are open to the possibility of this as they gave \$300,000 in funding to an Otago University research group with an end goal of finding a genetic solution for possum population control (Guthrie, 2021). The groups will conduct further genetics research into possums and the techniques required to be able to edit possums genes.

“Predator Free 2050 Limited (PF2050 Ltd) has partnered with the University of Otago to support a research team investigating new genetic technologies that could help eradicate possums from Aotearoa New Zealand by 2050”

## NEWS MEDIA COVERAGE ARTICLE 2

This news story outlines the use of gene editing in pest control in light of two research groups being granted funding for projects, even though gene editing practices are severely restricted under legislation. It is stated how science director from predator free 2050 granted the funding as part of a way to fill in ‘capability’ gaps to transform gene editing into a viable pest control method, one less controversial than the current method of 1080 poisoning. This innovation would have an environmental implication as gene editing in each individual specimen would not increase toxicity in the wider environment as much as 1080 poisoning. It is also mentioned how former conservation minister Eugenie Sage had a negative stance against gene editing for pest control given no overseas success stories and it was an ‘unproven’ technology. As of 2022, this is still true. However, in order for the technology to be able to be tested in situ, HSNO regulations on these restrictions would need to be changed. This is also an environmental implication as the effects of gene editing haven’t been studied insitu and there is no research on the affects the altered organisms could have on the environment. Ben Peters from University of Otago states that HSNO need to change with the times in order to get returns from the knowledge generated in New Zealand (Stacey ,2021).

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