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Science New Zealand on gene technologies

- Time to discuss how modern gene technologies can benefit New Zealand
- Need to update New Zealand's regulations

Opening a conversation

New Zealand needs to have an informed debate about how genetic technologies can meet the challenges the country faces. Regulations on its use should be updated so controls are proportional to the risks and benefits. Current regulations are 20 years old and the technology has advanced significantly since they were last amended in 2003.

Crown Research Institutes (CRIs) have a responsibility given by Parliament to engage in this conversation. The CRI Act requires CRIs to undertake research of benefit to New Zealand and to promote technological developments. In doing so, CRIs have to be socially responsible and apply ethical principles. CRIs are a source of information for the public about the science, terminology and issues in this area.

CRIs, and their sector partners, also bring knowledge from their role as key drivers of innovation in New Zealand's major export industries, high-potential new sectors and in protection of the environment.

Genetic modification technologies, in particular gene editing technology, offer potential benefits in improving health, protecting the environment, and developing new products that could help all New Zealanders. They provide another option to address the multiple challenges arising from climate change.

CRIs use genetic modification technologies in their research to help understand how organisms work. This can develop improved crops, ways of combating pests, and new treatments for disease. Under strict conditions, some CRIs have carried out field trials in New Zealand of genetically modified organisms (GMO) to test their benefits and safety. Some are also conducting GMO trials in the USA due to a more modern regulatory environment.

Genetic modification technologies

Since genetic modification technologies were first developed in the late twentieth century there have been huge strides in both the ease of use and, most importantly, the accuracy with which changes in an organism's genome can be made. There have been significant advances in understanding how modifications may affect wider gene activity, biochemical pathways, and physiological changes.

New, targeted technologies, called gene editing, offer the ability to precisely target genetic changes, often without the introduction of foreign DNA. These targeted technologies include CRISPR-Cas9 and related systems. The changes, for example from single base pair edits, can be indistinguishable from those that occur randomly in nature and cannot be detected as occurring from gene editing.

1/3

CRIs using gene editing as a tool in their research find it can help make the genetic changes more simply and predictably than older technologies. This means more quickly developing, say, new varieties of plants providing sustainable and nutritious food or organisms that grow the materials needed for a sustainable low-carbon bioeconomy.

As a result, there are new options for crops, farms and ecosystems. These include greener pastures, fewer pests, cleaner freshwater systems, options for controlled reversion from agricultural to native landscapes, more trees for materials, jobs and carbon reduction and without the risk of wild spread into the conservation estate.

The new technology also provides options in addressing wider challenges, not least those arising from climate change and its impact on food, the natural environment, water, animal and human health. Gene editing has the potential to accelerate how new crops and materials can be developed, supporting mitigation or adaptation in new environments.

New Zealand regulations and legislation

New Zealand's regulations covering use and development of genetic modification have not kept pace with the rapid changes in technology over the past 20 or so years.

The Hazardous Substances and New Organisms Act 1996 (HSNO Act) was formulated as genetic modification moved out of the laboratory and began to have real-world impact. Apart from a relatively minor amendment in 2003, the HSNO Act remains effectively unchanged, still focussed on old technology. Meanwhile, similar laws and regulations elsewhere in the world have moved on.

This situation makes use of gene editing in New Zealand outside the laboratory complex and expensive. It prevents CRIs and other innovators from realising the benefits of gene editing for New Zealanders.

Most international jurisdictions have made it much easier to use and trial the results of gene editing. Some recognise that changes made by gene editing could be achieved naturally, and so do not label it as genetic modification. New Zealand risks being outcompeted, particularly in nationally vital (and often world-leading) areas such as agriculture and pest control, by offshore innovators having easier access to gene editing technologies and lower barriers to its being implemented.

Māori engagement

The relationship between the Crown and Māori in these areas has also changed over the past 20 years. In particular, the Wai 262 claim (relating to flora and fauna) reinforces the need for a Te Tiriti-led partnership in ensuring that the rights and interests of Māori are protected and promoted as New Zealand investigates and uses techniques that change the genetic makeup of organisms.

Discussion on how Te Ao Pākeha and Te Ao Māori worldviews can inform the wise use of genetic editing technologies in New Zealand needs to be a central part of any consideration of changes to New Zealand's genetic modification regime.

Reports from various bodies

In recent reports, the Productivity Commission and the Climate Change Commission have both said that New Zealand will need to use modern gene editing technologies to meet the challenges facing the country.

In responding to the Productivity Commission, the Government said it was timely to start informed conversations around New Zealand's use of genetic modification technologies.

The conversation can also be informed by the work of the Royal Society Te Apārangi in its 2019 dialogue process. That report to Government noted the considerable benefits gene editing can bring to people's lives, not least in health including the developing field of precision medicine. Ethical considerations relating to medical and personal health issues are seen as distinct from considerations relating to plants, for example.

Additionally, the Prime Minister's Chief Science Adviser has noted that there is a spectrum of genetic modification technologies requiring different approaches to assess risk and benefit.

Conclusion

In the view of the Crown Research Institutes, it is time to have these informed conversations and to consider how New Zealand may appropriately take advantage of new knowledge to advance the wellbeing of the people and the country.

At a glance

- Regulations that govern genetic modification research in New Zealand are 20 years old and in need of urgent review. Crown Research Institutes, who have extensive experience with this technology, welcome an informed discussion about how these technologies can meet the challenges New Zealand faces.
- Rapid advances in gene editing technologies means they are safer and more accurate in in many areas of potential use.
- Used to their potential, the technologies offer multiple benefits. For example, they can accelerate the development of new crops to help feed growing populations; enable better farm management and deliver healthier ecosystems, with fewer pests and diseases and cleaner freshwater systems; and deliver more trees where they are needed (and fewer where they are not). All this can help develop more sustainable jobs and more prosperity in the regions.
- Many countries make it easier to trial and use gene editing technologies. New Zealand risks falling behind if sectors are unable to fully realise the benefits on offer. Bringing the regulations up to date would be a game-changer in helping to advance the wellbeing of New Zealanders and the country.