Transgenics Information Sheet

TE TIRA WHAKAMĀTAKI

What is it?

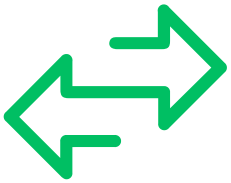
Transgenics refers to the process of transferring genes from one species to another. This creates organisms with new characteristics, like rice that produces its own vitamin A to treat malnutrition and salmon that grows twice as fast as normal salmon. Transgenic techniques were first used in the 1970s, and by the 1990s the first transgenic tomato hit the market in the US, which included a bacterial gene that increased the tomato's shelf life. The transgenics technique is at the heart of much of the controversy around genetic modification, often because it is associated with food production and involves transferring genetic material between different species. People often worry about the safety of this new technology and the risk of people 'playing god' by modifying living things.

How it works

When trying to understand the transgenic process, it can help to think of everyday examples of gene manipulation, one easy example is dog breeds. When breeding dogs, the goal is to bring the useful traits from one breed into another, but this is not a very precise method. Sometimes, breeds wind up with undesirable traits, or health problems depending on the mixes. This inaccurate mixing is similar to transgenics of the past, where traits didn't always end up in the right places. Transgenics today however is far more accurate, it allows you to take the exact trait from one dog breed and ensure that it is passed on without any of the issues that come with random mixing. The difference however between transgenics and standard dog mixes, is that in transgenics, genes could come from a cat and be added to the dog. **Transgenics is therefore the process of taking the desirable genes from a different species altogether to create a mix, often only very small changes.** Think about a dog with a cat's immunity to a specific disease, rather than the common Frankenstein thinking of a dog with a cat's eyes or tail.

Has it ever been used?

Yes, in agriculture many of the soybean, maize, cotton, and canola crops across the United States are transgenic crops. In conservation, nothing has been deployed however, research is in the works. One such program is looking at adding a wheat gene to the American chestnut to help it combat a destructive fungal blight.



Does it change the DNA?

Yes, transgenics relies on inserting a new gene into an organism, changing the DNA to include the new gene. This change would be passed onto future generations.

Why should you care?

Transgenics is becoming less common as more precise and targeted editing (such as CRISPR) becomes possible. However, it is important to look to transgenics as a pioneering genetic engineering tool and what the legal and ethical fallout of transgenic organisms has been internationally, as some of these issues will be similar for GMOs created using newer technologies. Additionally, while this is a less popular tool now, many existing crops were created using these technologies, making knowledge of them equally important.

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How could this be used in Aotearoa?

If the government were to overturn the laws that keep genetically engineered crops out, it is likely that we would see transgenic crops grown and used for kai in Aotearoa. These transgenic crops promise higher returns for farmers by incorporating pesticide genes so they don't get eaten by insects, or by having immunity to chemical pesticides so farmers can spray weeds while the crop grows. Because certain companies have given these crops a new gene, they have intellectual property rights over that GMO crop variety. In the United States there is a pattern of companies prosecuting farmers who have the varieties growing on their land without the company's permission (even if the GMO crops got onto the land by no fault of the farmers!). This can happen because keeping plants contained is very difficult. The GMO crops can escape the paddocks they are originally grown in as GMO seeds are carried by wind, water or animals. Their genes can also be transferred to other closely related plants through normal cross pollination. Some of the risks of this "escape" is that this could lead to plants in the environment that are immune to pesticides, which then become difficult to control and might end up becoming an invasive weed. Plants that have genes that make them resistant to pesticide can also increase how much farmers use pesticide, because there is less reason to carefully apply the pesticide. Plants that incorporate pesticide genes within them can also be harmful to native insects (or beneficial to introduced species like honeybees) when they feed on the leaves or nectar.

Additionally, maize and corn, crops sacred to Indigenous Americans, have been genetically engineered, and heavily commercialised, without consultation or benefit sharing with Indigenous communities. We should be aware that commercialised taonga species such as kūmara and mānuka could follow a similar path.

References & Additional Information

Golden Rice - Article

AquAdvantage Salmon Fact Sheet - Fact Sheet

Are GMOs Safe? Breaking Down the Science of Science-ified Foods - Article

How Engineered Bacteria Could Clean Up Oilsands Pollution and Mining Waste - Article

Use and Impact of BT Maize - Article

Monsanto Sued Small Farmers to Protect Seed Patents - Report

Bioethics | Biotechnology | Transgenic Organisms | GMO | Cloning | Don't Memorise - YouTube Video

Disclaimer: While we are committed to being a part of these conversations regarding Aotearoa New Zealand's future in synthetic biology, Te Tira Whakamātaki are neither for nor against the use of synthetic biology technologies for environmental protection purposes. The purpose of this information sheets is to inform and educate and to break down and explain some of the different terms and tools.This tools has been selected because it is frequently in the media and mentioned to us often, not because we hold any opinion on them.

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