

What is it?

RNAi stands for Ribonucleic Acid Interference. It's a little system inside our cells that helps to control how our genes work by helping to silence genes that aren't needed. Scientists discovered RNAi in the 1990s when they were studying how genes function and likened it to a switch that can turn genes on or off. This discovery won the Nobel Prize in Physiology or Medicine in 2006. RNAi shows promise as an alternative to poison baits due to its ability to act so specifically on one species.

How it works

Imagine your cells are like libraries full of books, and each book in that library represents a single gene. That gene, or book, contains instructions on how to make something your body needs, often the instructions for making certain proteins, essential molecules. Instead of loaning the book out, the librarian takes the book and makes a copy of it, this copy is RNA. RNA has many functions in the cell, such as creating proteins, or as we'll be discussing, carrying out RNA interference (RNAi). RNAi is like the quality control of the cell, when the copy goes wrong, if a book from a different section gets included, or if someone adds new incorrect pages to a book, RNAi stops it. For your body, this may include viruses which inject their DNA into you, which is then being stopped by the RNAi.

Scientists, however, have worked out how to use RNAi in different ways. For example, in medicine, RNAi has been suggested as a method to stop the production of cancer cells as well as in the treatment of many other diseases. In conservation, the focus is on pest management and pesticides. Specifically, **RNAi tools work so that instead of the cell following the instructions in that gene or book, it skips over them and doesn't make that protein.** This can be useful because it allows scientists to potentially control which genes are active or not without making changes to the actual DNA.

Has it ever been used?

Yes, in medicine the first RNAi based drug was released to the market in 2018. In conservation, many tools are in development, but none have yet been deployed.



Does it change the DNA?

No, RNAi only affects the RNA produced by an organism, which is like a readout of the original DNA. This means that any changes RNAi makes are reversible and won't be passed down to offspring.

Why should you care?

RNAi is currently under development for use on pests like wasps so it may soon be available for use in Aotearoa. **It presents with an opportunity to protect taonga species, by removing other threats without using poisons.**

Across the world, RNAi is being trialed to control agricultural pest insects like aphids and potato beetles. There is a real possibility that it might be used soon to control pests in Aotearoa.

How could this be used in Aotearoa?

Let's apply RNAi to a problem in Aotearoa, like invasive wasps that harm our ngāhere by competing with native birds, bats, insects and lizards for food, eating native insects and even killing newly hatched birds. Scientists can identify the gene in wasps that are responsible for their harmful behavior, such as the one that helps them reproduce quickly. Then, scientists create RNAi molecules that match up with that one wasp gene and only that one wasp gene.

What's special about RNAi is that it's quite specific—it aims to only target the species you want to target, in this case wasps. Closely related species may share the same genes though, meaning in some scenarios, it may be possible for non-target species to be affected. To use this in the environment, RNAi would be fed to wasps in a sugary bait. The RNAi molecules act like a signal to the wasps' cells, telling them not to use that gene. As a result, the wasps can't reproduce as fast, helping to control their population. Given that the RNAi is specific to wasps, if a tūi for example ate the sugary bait, it shouldn't affect them.

References and Additional Information

[RNA interference \(RNAi\): by Nature Video](#) - YouTube Video

[Novel RNAi Biopesticide from Renaissance BioScience Receives Canadian Regulatory Approval for Field Study](#) - Article

[RNAi: a novel tool for vertebrate pest management in Aotearoa New Zealand?](#) - Article

[The RNAi revolution](#) - Article

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 sheet is to inform, educate, break down and explain some of the different terms and tools. This tool has been selected because it is frequently in the media and mentioned to us often, not because we hold any opinion on them.