



Sound environmental management is good business
**CAWTHRON MARLBOROUGH
ENVIRONMENT
AWARDS
2023**

Sponsored by



JUDGES' REPORT

BUSINESS INNOVATION

DNAITECH

INTERVIEWED

Murray Broom

DATE

30 November 2022

JUDGES

Dorien Vermaas, Helen Smale, Bev Doole

INTRODUCTION

DNAiTECH is a Blenheim company developing new technology and instruments to test for disease and environmental issues out in the field.

Their DNA sampling and analysis technology gives results in the field for a quick response and action, rather than waiting for samples to be sent to a lab for analysis.

The software and equipment is easy to use and has a wide range of applications in testing for harmful pathogens in water, soil, plants, insects and humans. There is also an educational element to the business, which aims to introduce students to applying science to real-life situations.



The judges were impressed with DNAiTECH's potential to improve environmental monitoring, industry productivity, health diagnostics and science education.

GENERAL INFORMATION

DNAiTECH was established by molecular biochemist Dr Murray Broom and co-founder Tatiana Ceban in 2020. What started as an investigation into an educational programme in his garage during the first Covid lock-down has expanded into a DNA diagnostic company based at the Marlborough Research Centre's Grovetown campus. The company employs two scientists and a lab technologist.

This is not the first business start-up for Murray, who co-founded nanotechnology company Izon Science in 2005 which now has offices around the world. After selling his share and moving to Marlborough, Murray and Tatiana wanted to focus on education and “business for good as well as profit”. DNAiTECH is the result of that vision.

Traditionally environmental samples are sent away to a lab for analysis which takes time and money, especially if the sampling site is in a remote location. Murray has invented an extraction and analysis system that is portable, simple to use, and gives results on the spot.

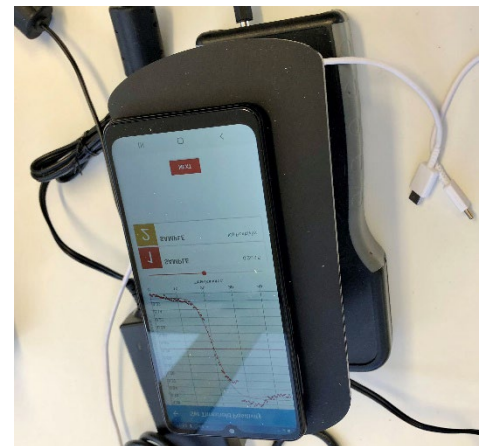
All DNA technologies require a form of extraction to get the DNA out from the sample, (eg, from a water sample for e-coli, or beehive swab for varroa) ready for analysis. Murray is using LAMP (loop-mediated isothermal amplification) chemistry to extract and analyse DNA in the field. LAMP is a fast-acting way to amplify DNA in a sample, ready for analysis without needing refrigeration or a laboratory.

The DNAiTECH Gen-2 is the analysis unit invented from scratch by Murray in his garage, right down to soldering the circuit board. The unit analyses DNA samples using an app on a Samsung Galaxy smartphone that indicates the presence and level of pathogens.

The Gen-2 is now manufactured by Kamahi Electronics in Dunedin. This is a strong business relationship that supports a New Zealand company and reduces exposure to overseas supply chain issues.

Armed with this technology, DNAiTECH is involved in developing testing and analysis for a wide range of environmental and biomedical applications:

- Water quality - rapid testing for e-coli (faecal contamination) and cyanobacteria (toxic algal blooms from increased nitrogen and effluent load). This project is well suited to science education in schools, allowing students to get a hands-on experience of science.
- Soil health - Diagnosing and improving soil health through microbe identification. Biologically active soils are important for biodiversity, crop production and long-term carbon storage. DNAiTECH is working with Plant & Food Research at Lincoln to develop soil health sensors and rapid diagnostics.
- Bee health - On-site beehive testing to enable early treatment of varroa and American Foul Brood disease, two serious threats to bees and the honey industry. Beekeepers usually work on remote sites and getting samples to testing laboratories is complicated and time-consuming. Often a hive will be destroyed without testing based on a suspicion of disease. DNAiTECH will enable beekeepers to identify whether there are pathogens on-site and take appropriate action. Commercial apiaries aside, a healthy bee population is vital for food crops and biodiversity.
- Kauri Dieback – a microbial pathogen is threatening what is left of New Zealand's kauri forests. There is no cure, but efforts are being made to stop the spread of soil that contains the microbe (eg. on machinery). Current testing takes 7-10 days, DNAiTECH is developing a test to get a diagnosis in 30 minutes.



- Corneal disease – corneal (eye) diseases can be viral, bacterial or fungal, and is often a cause of blindness in developing countries. Precision diagnosis on site would enable appropriate and early treatment.

These commercial applications have evolved from Murray and Tatiana's original idea to create an educational programme that connects secondary students with science and the environment. They are keen to make science accessible and relevant, especially for students at low-decile schools.

"The whole point is for the students to do state-of-the-art molecular biology but apply it in a real way to real-world environmental issues," Murray says.

Workshops range from one day to two weeks, and are focused on water quality of local streams, rivers and estuaries. Students sample and test for e.coli and toxic cyanobacteria, which is becoming an increasing problem with the rise in phosphates, nitrates and nutrients in waterways. Using smartphone technology helps engage the students, and they realise science can be fun and relevant, and perhaps career options open that they hadn't thought about before.



Two years since establishment, DNAiTECH has attracted a range of funders including AGMARDT, Ministry for Primary Industries, MBIE and Callaghan Innovation; and early clients include Plant & Food Research, Auckland Council and Australian Biosecurity.

THE JUDGES WERE IMPRESSED BY:

- The range of applications for better environmental and social outcomes. Great potential for on-site sampling and analysis for farming and forestry, aquaculture, State of the Environment monitoring, citizen science, catchment care groups.
- Education focus that engages young people with real-life science. Aimed at low-decile schools to show what opportunities are out there for further education and making a difference through applying science.
- Genuine engagement with Te Taiao (Maori respect for natural world). Hui with iwi at Lake Ellesmere/Te Waihora and integrating Maori values as part of the student water project, eg, saying a karakia when taking water samples.
- Integration/understanding of Te Reo in the business. Recognition of Maori values and respect for natural world. *Mauri ora te whenua, mauri ora te tāngata – When the land is healthy, the people are healthy.*
- An inclusive approach to staff management and commitment to nurturing scientists at the start of their career. There is a supportive culture of inspiring, sharing and discovery.
- Wanting to build a business driven by strong values from the start. This is reflected in the business objective to make diagnostic tools accessible and affordable for developing countries. "In business to make money, but not at any cost."
- A conscious choice to work with investors and suppliers with similar values and develop personal relationships based on trust and common cause.

PROBLEMS AND HOW THEY HAVE BEEN TACKLED

- *School resources* - Schools struggle to find the resources or time within the constraints of the curriculum to engage meaningfully. DNAiTECH received \$30,000 in MBIE Unlocking Curious Minds funding, which allowed them to develop and run several programmes. Further projects are being tailored to what schools can accommodate.
- *Phone technology* - The DNAiTECH Gen-2 analysis unit uses the camera on the Samsung mobile phone, but the camera changes as models are upgraded. To overcome this variability, the next generation DNAiTECH unit will have an inbuilt camera.
- *Funding bids* – DNAiTECH has raised finance through a range of funding bids, but these take a lot of time and there is no certainty of a successful result. The effort expended needs to be weighed up against the benefit received. Having said that, support from Callaghan Innovation has helped DNAiTECH attract post-grad students and bring them on board as staff.

SUMMARY

DNAiTECH is a strong example of a business out to achieve good... and make a profit.

The judges were impressed by the level of innovation, from idea to software and hardware, and the wide range of applications the testing and analysis technology can be applied to.

Inventing, problem-solving and doing good is part of Murray's DNA and he has channelled that into a company that is driven by making a difference for people and the environment.

SUGGESTIONS

- DNAiTECH is still in the early stages of commercialisation and may benefit from focusing on fewer projects until a stronger foundation is in place. Developing a relationship with a business mentor may provide a fresh pair of eyes and help provide focus/prioritise effort. www.businessmentors.org.nz
- Investigate making the disposable test kits out of recycled plastic and/or materials that can be recycled.
- Consider connecting with the University of Canterbury/Lincoln University [Masters of Water Sciences Management](#) as a way to expose your testing technology to up-and-coming environmental scientists.
- For education opportunities in Marlborough, make contact with Liz Webb, Regional Public Service Advisor for the Ministry of Social Development in the top of the South. Liz arranges services for students unable to fit in the school system. Ph 03 984 7561. Mob: 029 909 5002.
- Consider some coaching in concise communications to help with pitching for investment and grant applications.
- Now we've found out about your back story, it would be good to get more of that on the website – your values, emphasis on education, inventing a foldable kayak.
- Install more visible signage at your office premises to guide visitors.

- To help fulfil your vision to become B-Corp registered, consider making contact with companies that have been through the process. Eg, Florence van Dyke, co-founder of Chia Sisters in Nelson and now Sustainability Manager at NZ Trade and Enterprise. florence.vandyke@nzte.govt.nz.

Also, Digital Agency Springload is a B-Corp technology company in Wellington.
Contact Claire Everett hello@springload.co.nz
04 801 8205 www.springload.co.nz