Revolutionary handheld DNA diagnostic unit allows lab-quality analysis in the field

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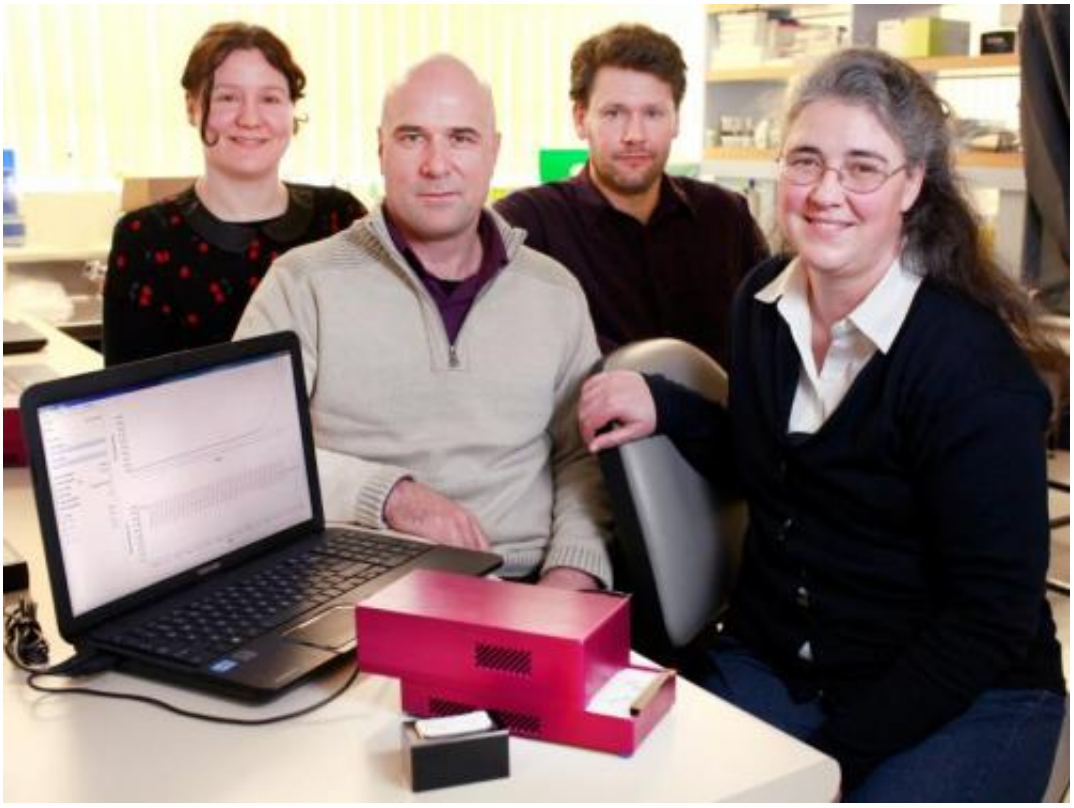

A revolutionary handheld and battery-powered DNA diagnostic device invented at the University of Otago is poised to become a commonly used field tool for rapidly detecting suspected viruses or bacteria in samples while also determining the level of infection. Credit: Sharron Bennett

A revolutionary handheld and battery-powered DNA diagnostic device invented at New Zealand's University of Otago is poised to become a

commonly used field tool for rapidly detecting suspected viruses or bacteria in samples while also determining the level of infection.

The breakthrough device, dubbed Freedom4, is being unveiled today at the Queenstown Molecular Biology main meeting. It takes advantage of a technology called quantitative PCR to identify target DNA sequences in real-time, without the need for further processing.

As an example, using Freedom4, the presence and extent of norovirus infection in a sample could be confirmed within less than an hour, while the person using the unit was still at the outbreak site.

Dr Jo-Ann Stanton, who led the programme to develop the device, says that as well as enabling 'anytime, anywhere' clinical diagnosis of viral infectious diseases in humans and animals, it also has many other potential uses, such as border security, forensics or environmental monitoring.

Developed by Dr Stanton's multidisciplinary team at Otago's Department of Anatomy, the sturdy unit weighs the same as a typical laptop and fits on the palm of your hand. Freedom4 boasts a six-hour battery life and can be tethered to a laptop, or connect wirelessly to smart phones or tablets running custom software that analyses and interprets the test results.

"This mobility could provide a great boon for farmers. For instance, vets could drive around a farm analysing samples from various locations, make their diagnoses and treat infected animals—all in one trip," she says.

A prototype of the device has been independently put through its paces by the New Zealand Institute of Environmental and Scientific Research.

After running assays for toxin-producing E. coli, and several gastrointestinal and respiratory viruses—including H1N1—Freedom4 was found to perform on a par with much larger laboratory-based DNA analysis systems.

Dr Stanton says she and her team are delighted that their six-year project to make a handheld point-of-care diagnostic device a reality has come to fruition.

"We are immensely proud that we have created this brilliant device; there is currently no other system in the world that compares in terms of the analytical power we have achieved at this level of mobility and ease of use."

Dr Stanton's team includes a physicist, computer programmer, a chemist and biologists. Their project was funded through a New Economy Research Fund (NERF) grant, from what is now New Zealand's Ministry of Business, Innovation and Employment. NERF objectives include supporting investigator-initiated basic research that has the potential to create the advanced technological platforms that will underpin new and emerging industries.

The University's commercialization arm, Otago Innovation, is now working to spin out the technology in partnership with a New Zealand company named Ubiquitome.

Otago Innovation's Senior Commercialization Manager David Christensen says that Freedom4's development exemplifies university research being successfully translated into real-world technology with enormous potential health, economic and environmental benefits.

"Dr Stanton and her colleagues have used their combined multidisciplinary expertise to overcome a number of daunting technical

challenges to create a molecular diagnostic device that is truly world-leading," Mr Christensen says.

It is another great example of technology transfer from the University of Otago, he says.

"We are delighted to be a part of Ubiquitome as it works to realize its dream of connecting the world to meaningful genomic information through handheld, cloud-connected genetic analysis devices."

Provided by University of Otago