Research collaboration uses cutting-edge technology to produce new veterinary drug

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Researchers from Victoria University of Wellington's Ferrier Research Institute, Callaghan Innovation, the University of Canterbury, and Massey University have developed cutting-edge gene engineering technology to help scientists more efficiently manipulate DNA in order to produce new products, including a new veterinary drug.

Ferrier Research Institute researchers have used this novel technology to produce a new flea treatment for domestic pets by manipulating a compound called nodulisporic acid A.

"When used in insecticides, nodulisporic acid A is very effective at controlling fleas and ticks in domestic pets, but it is currently difficult to produce," says Kyle van de Bittner, a Ph.D. student at Ferrier Research Institute. "It is naturally produced in small quantities by a type of fungus, but until now the complexity of the compound and the fungus have prevented scientists from producing the compound in greater quantities. This has greatly impeded any development of drugs that include nodulisporic acid A."

Using the new gene engineering technology, Ferrier staff have been able to better understand the compound and take the first steps towards producing it in greater quantities. They have identified the genes involved in producing an early stage of nodulisporic acid A, and been able to transfer those genes into a different fungus. This fungus grows quickly and has biological qualities which help speed up the process of making nodulisporic acid A.

There are additional advantages to the method.

"Rather than relying on toxic solvents typically used in the chemical synthesis of compounds like this, we use sugar water to grow the fungi to create the compounds," Kyle says. "This is cheaper and more environmentally-friendly than current methods."

Ferrier staff plan to continue development of the compound. They are also working with Matt Nicholson at VicLink, Victoria University's commercialisation arm, to create a commercial product based on their work. The commercialisation work is funded by Kiwinet.

"This is just the beginning," Kyle says. "We still have a great deal of work to do to finalise the production of our key chemical target, nodulisporic acid A, and optimise the fungus to make more of it. But the science is delivering and we are inspired to push the limits of what is possible."

The new veterinary medicine was made possible by a novel technology called MIDAS (Modular Idempotent DNA Assembly System). MIDAS is a synthetic biology system that gives scientists more control over the DNA they manipulate during their research, resulting in a faster and more efficient way to make new pharmaceuticals, biofuels, antibodies, and more.

"Using MIDAS, scientists can more rapidly assemble new genes from a library of DNA parts," says Callaghan Innovation scientist Dr. Craig van Dolleweerd, who designed the MIDAS technology. "They can quickly test what the new genes do, and how they interact with other genes. This will greatly speed up research into the discovery of new biochemical pathways and the manufacture of new synthetic biology products, which includes everything from biofuels to fragrances."

An article about the MIDAS technology was recently published in *ACS Synthetic Biology*, a leading journal in the new area of synthetic biology, and the nodulisporic acid A research appeared in the *Journal of the American Chemical Society*, the highest ranked chemistry journal in the world.

There are patents pending on both the MIDAS technology and the production of nodulisporic acid A, both of which have been developed with funding from the Ministry of Business, Innovation, and Employment and Fulbright NZ.

Provided by Victoria University of Wellington