Researchers engineer new proteins to help solve global problems

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Researchers from Victoria University of Wellington's Ferrier Research Institute have made significant progress in the science of protein engineering, achieving a breakthrough which has implications for tackling global problems from diseases to climate change.

Dr. Effie Fan and Professor Emily Parker, along with other researchers from the Maurice Wilkins Centre, have created a new approach to protein engineering inspired by natural evolution. Using their method, they have successfully combined different parts of natural proteins to form new proteins.

"Successfully combining different parts of natural proteins to create new, fully functioning proteins is something that has never been done before," says Dr. Fan. "By using fully functioning parts of a natural protein as a starting point, we can make the process of protein engineering much faster and more effective. This is a huge step forward for protein engineering."

This research has implications for everything from vaccines to crop growth.

"Everything in nature, from humans to bacteria, is made of proteins, and through evolution proteins can change in a certain way to solve certain problems – like making people immune to a disease," says Dr. Fan. "But evolution is a slow process, and there are some problems – like cancer, viral epidemics, and climate change – that we don't have time for nature

to solve on its own. The goal of our field of science is to manipulate proteins in the lab to solve these problems soon."

Dr. Fan and Professor Parker's research has specific implications for antibiotic development.

The Victoria University research team used proteins that are part of the bacteria that cause tuberculosis and gastric cancer in their research.

"Now that we can manipulate the proteins in these bacteria, we know more about how the proteins work and how they help the bacteria cause disease. We can use this knowledge to help create antibiotics to help fight these diseases, many of which are currently resistant to modern antibiotics."

The proteins found in these specific bacteria are also found in many other living organisms. Because the proteins are so common, the techniques developed by the team could also be used to manipulate proteins in other ways to help with other global problems.

The research was recently published in the U.S. National Academy of Science's official scientific journal *Proceedings of the National Academy of Science*.

More information: Yifei Fan et al. Exploring modular allostery via interchangeable regulatory domains, *Proceedings of the National Academy of Sciences* (2018). DOI: 10.1073/pnas.1717621115

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