Key element in bacterial immune system discovered

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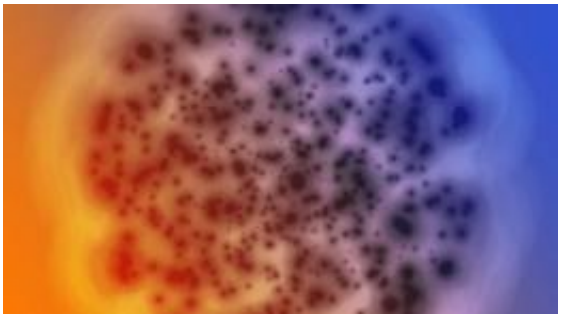

Bacteria

A University of Otago scientist is a member of an international research team that has made an important discovery about the workings of a bacterial immune system. The finding could lead to the development of tailor-made RNA-editing tools.

RNA is the molecule that translates DNA's genetic instructions into the production of the proteins that are the building blocks of cells.

In a recent paper in the leading journal *Science*, the team has shown how a surveillance complex in the bacterial immune system is able to target specific sites on RNA molecules to destroy invading viruses and other foreign genetic elements.

The researchers, who include Otago postdoctoral fellow Dr Raymond

Staals, believe this targeting mechanism could one day be adapted to engineer microbes to serve a variety of purposes, including environmental clean-up, green chemistry, and the production of safer, more effective therapeutic drugs.

In their paper, the team have provided the first high-resolution structural images of a fully intact Type III CRISPR-Cas surveillance complex bound to its target RNA, thereby showing how the RNA-targeting mechanism in this complex works.

Dr Staals, who is based in Otago's Department of Microbiology & Immunology, says the complex recognises and snips single-stranded RNA molecules at multiple sites allowing bacteria to destroy viral genetic material before it hijacks their cells.

"A hand-like structure in the complex grips the RNA target, and then a thumb-like structure on the hand pushes the RNA into the right position in the catalytic site to be cleaved," he says.

The researchers say the structural data they have gained suggests ways in which this RNA-targeting mechanism could potentially be re-purposed for RNA-interference applications.

RNA interference is a natural mechanism involved in sequence-specific gene silencing and holds promise for revolutionising areas such as medicine, where specific genes in diseased tissues could be selectively turned off.

"It is quite exciting to think that a tool that has evolved through the eternal invisible war fought between bacteria and viruses could one day be adapted to effectively and safely treat deadly human diseases," Dr Staals says.

More information: Structures of the CRISPR-Cmr complex reveal mode of RNA target positioning *Science* DOI: 10.1126/science.aaa4535

Provided by University of Otago