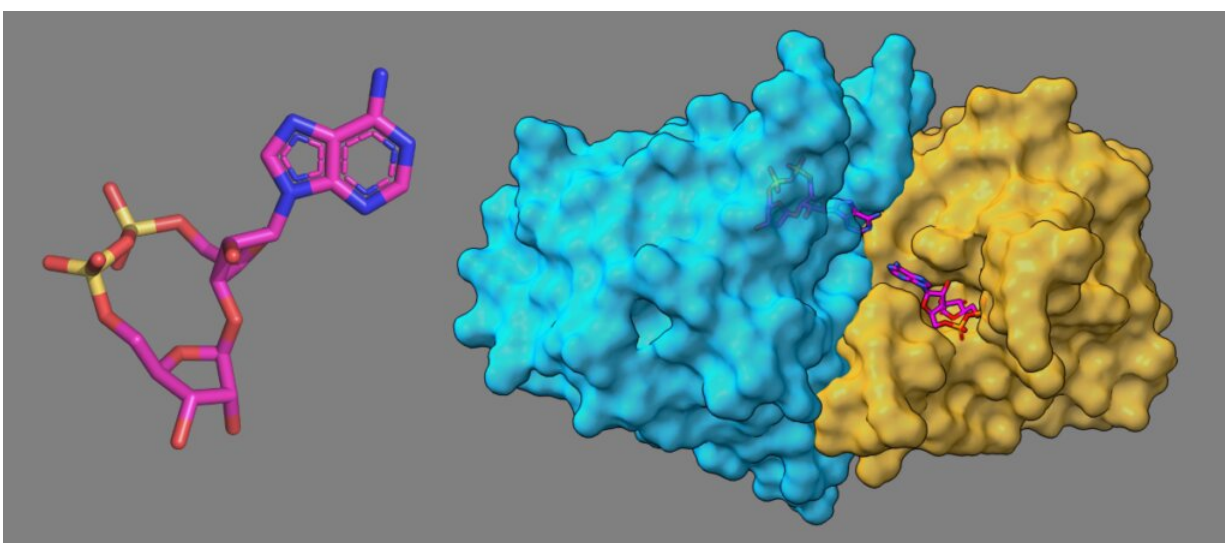


# New research identifies a bacterial 'Jekyll and Hyde' molecule involved in immune responses

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Structures of 3'cADPR (left) and the Thoeris defence system in complex with 3'cADPR (right). Credit: Griffith University

Griffith University researchers have played a key role in investigating a new molecule that protects bacteria against viruses and is associated with bacterial infection of plants.

Dr. Thomas Ve, a lead researcher at Griffith University's Institute for Glycomics and co-senior author on the new *Science* paper, said [bacteria](#)

are on the watch for [viral infections](#) and have evolved a large repertoire of defense systems to protect themselves.

"Studying such defense systems have in the past led to powerful molecular tools that may one day be used for new treatments of diseases," Dr. Ve said.

The aim of the study was to look at bacterial enzymes that cleave a ubiquitous nucleotide called NAD ([nicotinamide adenine dinucleotide](#)) and produce new signaling molecules.

"These signaling molecules take part in a virus defense system called Thoreris," Dr. Ve said.

"Surprisingly, our research shows one of these molecules—called 3'cADPR—is not only an activator of the Thoreris defense system but is also associated with suppression of the immune system in plants."

The researchers used a suite of structural biology techniques such as [nuclear magnetic resonance](#), [cryo-electron microscopy](#) and X-ray crystallography to reveal the chemical structures of these signaling molecules and how they are produced and function.

"We were able create three dimensional snapshots of how they are produced and how they activate the Thoreris defense system," Dr. Ve said.

"Time will tell if this basic research leads to new technologies with the potential to treat or prevent diseases."

Institute Director, Professor Mark von Itzstein AO said this fundamental research brings substantial new insight to complex biology.

"This study published in the journal *Science* provides atomic level detail of an intricate biological process," Professor von Itzstein said.

"The study outcomes open up new areas of endeavor that could have significant biological impact."

**More information:** Mohammad K. Manik et al, Cyclic ADP ribose isomers: Production, chemical structures, and immune signaling, *Science* (2022). [DOI: 10.1126/science.adc8969](https://doi.org/10.1126/science.adc8969)

Provided by Griffith University

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