

Researchers see activity of bacterial effector protein in molecular detail

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Many plant and animal pathogens deploy effector proteins as part of their 'molecular arsenal' to facilitate infection and colonisation of their hosts. New research has revealed the structure of a bacterial effector molecule bound to its target protein in the host.

Gram-negative bacterial pathogens can deliver effector proteins through a specific secretion system, directly into host cells, to manipulate host [cell processes](#) for the benefit of the pathogen. The host cell processes targeted by effectors and the mechanisms used for manipulation are diverse. Knowledge of how effectors interface with host cell molecules is critical for understanding both mechanisms of pathogenesis and how effectors could be used to deliver new insights into [host cell](#) biology.

Dr Mark Banfield at the John Innes Centre, funded by a grant from the Biotechnology and Biological Sciences Research Council (BBSRC), has uncovered the structure of a bacterial effector molecule called 'Cif' bound to its target (NEDD8) from the host. The Cif effector is found in a number of [pathogenic bacteria](#) including strains of *E. coli*, *Burkholderia*, *Photorhabdus* and *Yersinia* species.

Delivery of Cif into host cells results in perturbation of the cell division cycle. One hypothesis suggests this could prevent rapid renewal of infected cells such as those in the lining of the gut, so helping bacterial colonisation. Researchers at the John Innes Centre also studied the [enzymatic activity](#) of the effector protein in solution, and in collaboration with Drs. Taieb and Oswald, who are based in Toulouse,

France, in model host cells.

Their work, publishing in the [Proceedings of the National Academy of Sciences](#) Online Early Edition this week, used protein structure determination to reveal the interface formed between the bacterial effector and the host target. The knowledge of this interface at the molecular level allowed small, directed changes to be made to the effector to determine the regions of the interface important for the interaction and the enzymatic activity in solution and in cells.

A thorough understanding of how this effector acts at the molecular level not only provides new information about the virulence mechanisms used by pathogens, it also suggests ways in which these effectors could be used as tools to probe functions related to the cell cycle, and how this relates to cellular biology.

More information: The molecular basis of NEDD8 deamidation by the bacterial effector protein Cif, Allister Crow, Richard K. Hughes, Frédéric Taieb, Eric Oswald & Mark J. Banfield, *PNAS*, 10.1073/pnas.1112107109

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