Viruses are capable of outmanoeuvring the ability of bacteria to commit 'suicide,' new research shows

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(Phys.org)—In an extraordinary example of altruistic behaviour, bacteria are capable of giving up their lives rather than allowing a viral infection to spread through their population. Now, new research has shown that viruses have evolved a mechanism that blocks bacteria from killing themselves.

The viral evasion process has been discovered in a strain of the potato

soft rot and blackleg bacterium Pectobacterium atrosepticum by Professor George Salmond at the University of Cambridge's Department of Biochemistry and researchers at the University of Otago, New Zealand, and was published on 18 October in the journal PLoS Genetics.

Bacteria commit altruistic suicide by producing a lethal toxin within their cells after being infected by certain viral parasites, known as bacteriophages. The new study has shown that bacteriophage mutants have evolved that can suppress the toxin.

These rare mutants produce an antitoxin made of the genetic material RNA. Because the antitoxin is similar to an antitoxin normally manufactured by the bacteria, it prevents the toxin from completing its lethal function, and the virus can continue replicating without becoming a victim of the host's defensive system.

"This work highlights the incredibly dynamic world of adaptive co-evolution in bacteria and their viruses," said Professor Salmond, whose research was funded by the BBSRC. "The emergence of an RNA-based molecular mimicry in the virus to suppress bacterial suicide is an exciting observation."

The mutant bacteriophage is also able to transfer DNA encoding the defence system to a new bacterial host. In doing so, it may indirectly create populations of host cells inside which it can successfully replicate, while potentially providing the new host with better protection from competing viral predators.

"Multiple alternative and novel routes, through which different bacteriophages may evolve to evade abortive infection, remain to be discovered," added Salmond. "Because the bacteriophage investigated can pick up DNA from one bacterium and transfer it to a new host, this meant that escape mutants might be able to transfer the abortive

infection system to other hosts – and that was confirmed. In effect, this could be viewed as an example of 'infectious altruism' – with a virus acting as a vector to transmit an antiviral defence system between bacteria."

Provided by University of Cambridge