'David and Goliath' viruses shed light on the origin of jumping genes

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University of British Columbia researchers have identified a small virus that attacks another virus more than 100 times its own size, rescuing the infected zooplankton from certain death. The discovery provides clues to the evolutionary origin of some jumping genes found in other organisms.

The study, by UBC marine microbiologist Curtis Suttle and PhD student Matthias Fischer, is published online today in Science Express. It describes the marine virus Mavirus and its interaction with marine zooplankton *Cafeteria roenbergenesis* and CroV, the world's largest marine virus.

"It's a microbial version of the David and Goliah story where, after infecting Cafeteria roenbergeneis, Mavirus protects it against infection by CroV, while ensuring its own survival," says Suttle.

Viruses rely on host cells to replicate; in the case of Mavirus, its host is another virus, making it only the second known virophage. It needs CroV to replicate, and in the process suppresses the propagation of CroV.

"What makes this interaction significant to evolutionary biology is that the closest genetic relatives to Mavirus are mobile genetic elements found in single-celled and higher organisms," says Suttle. "This implies that over evolutionary time, organisms have co-opted the DNA from ancient relatives of Mavirus into their own genomes, presumably so that they could acquire immunity against giant viruses like CroV.

Transposons, or jumping genes, are bits of DNA that can move or "transpose" themselves to new positions within an organism's genome. Researchers have suspected that a subset of transposons – called Maverick transposons – have a viral origin because of the nature of their DNA sequences.

Suttle and Fischer's latest work on Mavirus provides the first concrete evidence of this connection.

"Because they've sequestered the virophage DNA into their own genomes, organisms probably don't need to rely on being infected by a second virus to protect themselves," says Suttle.

Suttle and Fischer previously identified CroV as the world's largest marine virus, with a complex genome that has made it remarkably independent of its host cells.

Provided by University of British Columbia