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Altruistic suicide in organisms helps kin

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The question of why an individual would actively kill itself has been an evolutionary mystery. Death could hardly provide a fitness advantage to the dying individual. However, a new study has found that in single-celled algae, suicide benefits the organism's relatives.

"Death can be altruistic – we showed that before – but now we know that programmed cell death benefits the organism's relatives and not just anybody," says Dr Pierre Durand from the Department of Molecular Medicine and Haematology and the Sydney Brenner Institute for Molecular Bioscience (SBIMB) at Wits University.

When Durand and his colleagues from the University of Arizona released the results of their first study on suicide in single-celled algae in 2011, they showed that when an organism commits suicide by digesting up its own body, it releases nutrients into the environment that can be used by other organisms.

Now they've proven that these nutrients can only be used by relatives. In fact, the nutrients inhibit the growth of non-relatives, so not only does suicide benefit relatives, it can also harm competitors. This is remarkable. Even after death an organism can continue to exert species-specific fitness effects on its neighbours.

"If one focusses purely on the individual organism, programmed death doesn't fit with the paradigm of survival of the fittest. Why should something like suicide exist at all? This has been an evolutionary mystery and we have discovered one of the clues," says Durand.

The team used Chlamydomonas reinhardtii (a type of alga) as a model organism, but they suspect that this phenomenon is happening in all unicellular organisms. The trigger is a stressful environment. "When the environment becomes difficult for everybody, some individuals sacrifice themselves for the benefit of kin. We suspect that it's the older and more damaged who are more likely to commit suicide," says Durand.

For example, during algal blooms in freshwater or marine environments the nutrients eventually run out causing some algae to commit suicide to sustain the others.

The increased environmental stresses of climate change could also impact the dynamics of programmed death. "The planet won't be able to sustain everyone at the current rate of exploitation. Whether we're talking about humans or microbes, it's becoming a crowded place and this is impacting the way microbes respond," says Durand.

The paper has been published in the scientific journal *Biology Letters* and was co-authored by Durand, Rajdeep Choudhury, also from the SBIMB, and Armin Rashidi and Richard Michod from the University of Arizona.

Provided by Wits University