

Bacteria perform mass suicide to defend their colony

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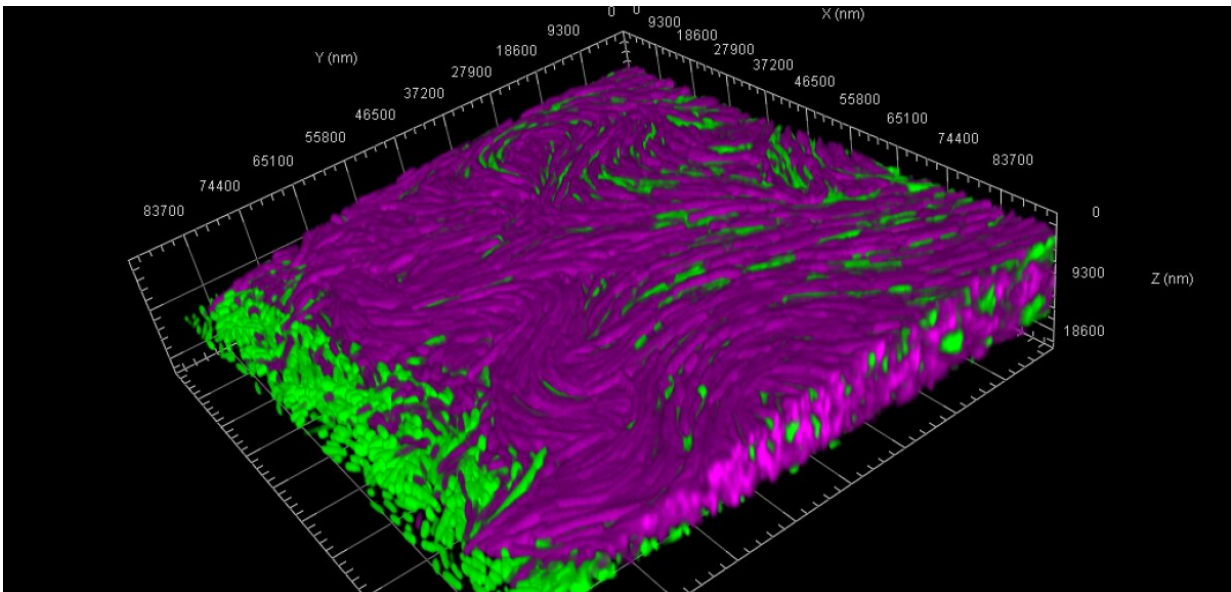


Illustration shows magenta cells bursting open, committing suicide and releasing toxins to kill the competitor and save their clonemates. Credit: Elisa Granato

A new study from researchers at Oxford University's Departments of Zoology and Biochemistry shows that warring bacteria will engage in suicidal attacks in vast numbers to take down competitors.

Bacteria are aggressive organisms that have evolved a host of draconian ways to kill and inhibit their competitors. One of the most extreme of these strategies is where [cells](#) actively break themselves apart and die to

release large toxins that kill other strains. While it was known that some [bacteria](#) do this, the extent of the [behavior](#) was not known and it was typically assumed that only a few cells would perform these suicidal attacks.

A new study, published today in *Current Biology*, shows this is far from the case: in some areas of bacterial battlegrounds, almost all cells will kill themselves to generate a massive simultaneous attack.

Suicidal behaviors are very rare in the natural world and it is typically hard to understand why they would evolve. This study reveals that millions of bacteria will simultaneously engage in a suicidal behavior. Moreover, it shows that this occurs in the best studied of all bacteria: the common gut bacterium, *Escherichia coli*. This discovery has striking similarities to behaviors seen in [social insects](#), bee and ants, which also launch large scale attacks against intruders where many of them perish.

Co-author, Dr. Elisa Granato from Oxford University Departments of Zoology and Biochemistry, says: "The sheer number of bacteria that died in these attacks was very surprising. But the study explains why they do this: cells engage in the suicidal behavior when they are about to die anyway from a competitor's toxin. This behavior represents a last gasp attack from dying cells, which allows them to mount a formidable counter attack before they themselves perish."

The authors studied bacterial battleground in the laboratory, using 3-D time-lapse fluorescence microscopy. They found a way to make the cells change color when they were engaging in the suicidal behavior. This allowed them to follow [single cells](#) at the front line over time as they engage with competitors and see when and how many cells perform these attacks.

Co-author, Professor Kevin Foster, says: "Bacteria, like *E. coli*, can be

both deadly pathogens and protective symbionts that live inside us. Whether these bacteria win their wars, therefore, can be the difference between [good health](#) and a devastating disease. The study of bacteria warfare, therefore, might help us to both push back pathogens and promote so-called 'friendly' bacteria."

The researchers hope that by understanding the rules of bacterial warfare more generally and using this to design probiotic bacteria they can be used to promote health and treat infections.

The paper, "The evolution of mass suicide in bacterial warfare," is published in *Current Biology*.

More information: Elisa T. Granato et al. The Evolution of Mass Cell Suicide in Bacterial Warfare, *Current Biology* (2020). [DOI: 10.1016/j.cub.2020.05.007](#)

Provided by University of Oxford

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