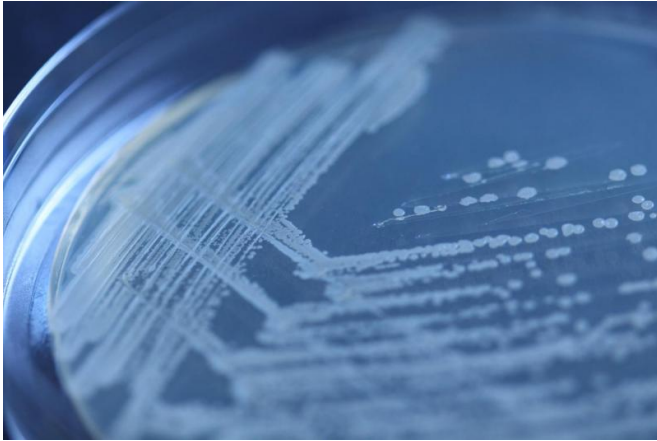


Genetic mutants alter entire biological communities

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Colonies of *Bacillus subtilis*, the focal species of bacteria in the study, growing on an agar plate. This bacterium is found in a variety of environments, from soil to the human gut. Credit: Deirdre McClean

Scientists from Trinity College Dublin have discovered that one gene mutation in a single species can trigger dramatic changes in whole biological communities; changes can be as great as those caused by the extinction of a top predator.

By using bacteria to replicate ecological systems in the lab, they found that mutations of a single gene that alter how one bacterial [species](#) interacts with others had huge structural impacts across their multi-species microbial communities. These 'social mutants' varied in their ability to produce biofilms, many of which cause significant health problems in people. This had knock-on impacts on other species that, in turn, completely altered the structure of the communities.

"We know that predators are hugely important in influencing how ecosystems are structured, as they control the numbers and diversity of other species in the food web. It is incredible that such a small

genetic change can cause these mutants to completely alter communities as much as the extinction of something as important as a predator," said Assistant Professor in Zoology at Trinity, Dr Ian Donohue.

Results of the study indicate remarkable scope for fine-scale genetic differences within populations to alter entire ecosystems - not only microbial ones, but also large-scale ecosystems such as lakes, forests and marine systems. The species used in the study are common in both soil and freshwater environments.

Much ecological research has focused on the likelihood of species extinctions following environmental change, such as deforestation and increasing temperatures, and their knock-on effects on communities.

However, changes in environmental conditions also have the potential to trigger mutations and microevolution. The results of this study suggest that microevolution may be an important, but currently overlooked, factor shaping the response of communities to [environmental change](#).

"It's amazing to know that just one change in a single gene has the potential to have such a huge effect that it can change whole ecosystems," said Deirdre McClean, lead author of the study and PhD Researcher in Zoology at Trinity.



Colonies of *Serratia marcescens*, one of the bacteria species used in the study, growing on an agar plate. This common bacterium is sometimes responsible for causing hospital-acquired infections in humans. Credit: Deirdre McClean

The findings will have implications for disease researchers and drug developers as well as ecologists and geneticists.

"Aside from the big-picture message, developing our understanding of the effects of bacterial behaviour on community composition might prove critical in the development of treatments aimed at manipulating our gut microbiota, for example," added Dr Donohue.

Provided by Trinity College Dublin

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