BACTERIAL ECOLOGY

Microbial communities hold the fort

Different bacterial species that inhabit the same environment can form a robust community. However, how these communities respond to changes in the environment and what makes them stable in the presence of potential invaders have not always been clear. Now, two articles in *The ISME Journal* investigate the stability of bacterial communities when challenged with changes in nutrient levels and the presence of invaders.

In the first article, Bowen and colleagues studied the effect of changes in nitrogen levels on the community structure. They sequenced 16S ribosomal RNA tags to determine the composition of the bacterial communities on plots of salt marsh that had undergone regular fertilization and on nearby control plots that had not received fertilizer, and found that there was little difference between the two communities. Thus, no bacterium in the community had exploited the excess nutrients and no newcomers became established in the community. The authors next looked at the number of bacteria with the nitrate reductase (*nirS*) gene, which encodes an enzyme in the denitrification pathway (in which inorganic nitrogen is converted to N_2), and found only small differences in the abundances of *nirS* from different species when comparing the fertilized and unfertilized plots. This led the authors to speculate that any adaptation in the community probably occurred at the level of transcription of genes that are responsive to the altered nutrient levels.

To determine what aspects of a bacterial community prevent the incorporation of invaders, Jousset and colleagues tested the effect of the genotypic richness and relatedness of a bacterial community on the ability of that community to resist the establishment of unrelated bacteria. They constructed a total of 96 different communities by mixing up to eight strains of *Pseudomonas fluorescens* and exposing them to a single strain of *Serratia liquefaciens*, which commonly shares its soil habitat with *P. fluorescens*. The authors found that the ability of *S. liquefaciens* to invade decreased as the genotypic diversity of the *P. fluorescens* community increased. The authors speculate that communities with higher genotypic diversity may be more efficient and use a wider variety of nutrients, leaving fewer niches for invaders. Indeed, the genotypic dissimilarity also correlated with the total density of *P. fluorescens* cells in the community before the addition of the invader, reflecting an increase in the community productivity. In addition, the authors found that toxin production was important for the stability of the community.

Together, these articles show that microbial communities can be robust and their resistance to invading bacteria may be determined by their genetic diversity.

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ORIGINAL RESEARCH PAPERS Bowen, J. L. *et al.* Microbial community composition in sediments resists perturbation by nutrient enrichment. *ISME J.* 17 Mar 2011 (doi:10.1038/ismej.2011.22) | Jousset, A. *et al.* Intraspecific genotypic richness and relatedness predict the invasibility of microbial communities. *ISME J.* 24 Feb 2011 (doi:10.1038/ismej.2011.9)