

MICROBIAL ECOLOGY

Strong fences make good neighbours



bacteria can differentiate between surrounding microorganisms and tailor their responses



Outside of the laboratory, bacteria have to share their space and compete for nutrients with many other microorganisms, and they may therefore find it advantageous to perceive which neighbour is around and respond accordingly. Garbeva and colleagues report in the *ISME Journal* that bacteria may have a general response to the presence of competing microorganisms, as well as a variety of responses targeted to specific bacteria.

To investigate how bacteria respond to the presence of different microbial competitors, the

authors co-cultured *Pseudomonas fluorescens* Pf0-1, a soil bacterium, with each of three phylogenetically unrelated bacteria, the Gram-positive *Bacillus* sp. V102 and the Gram-negative *Pedobacter* sp. V48 and *Brevundimonas* sp. V52. Co-culturing of *P. fluorescens* Pf0-1 with *Pedobacter* sp. V48 had little negative effect on the growth of *P. fluorescens* Pf0-1, whereas co-culturing with *Bacillus* sp. V102 greatly decreased the number of *P. fluorescens* Pf0-1 colony-forming units. Furthermore, the authors detected big differences between the transcriptional responses of *P. fluorescens* Pf0-1 to the presence of the three bacteria. Although the number of genes with altered expression levels ranged from 375 to 571, the majority of these changes occurred in the presence of only one or two of the three species. The expression levels of only 42 genes were changed by all three species, and most of these genes encode metabolic and motility functions, indicating that there may be a core response to the presence of other bacteria.

As several of the *P. fluorescens* Pf0-1 genes induced by the presence of the two Gram-negative species could potentially be involved in the production of polyketide antibiotics, the authors determined whether hypothetical antibiotics play a part

in the process. They extracted small compounds from the agar surrounding *P. fluorescens* Pf0-1 colonies that had been grown in the presence of *Pedobacter* sp. V48, and tested for the presence of antimicrobials. All three of the co-culture species, as well as saprophytic fungi that live in the same environment as *P. fluorescens* Pf0-1, were sensitive to compounds in the agar. Deletion of the upregulated loci that may play a part in the production of the proposed antibiotic abolished the antimycotic effect of the extract. Confirming that production of the antibiotic is a species-specific response, similar extracts from *P. fluorescens* Pf0-1 grown in the presence of *Bacillus* sp. V102 had no antimicrobial activity.

These results show that bacteria can differentiate between surrounding microorganisms and tailor their responses. Exactly which cues are detected to distinguish between the neighbours remains to be determined.

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ORIGINAL RESEARCH PAPER Garbeva, P. et al. Transcriptional and antagonistic responses of *Pseudomonas fluorescens* Pf0-1 to phylogenetically different bacterial competitors. *ISME J.* 13 Jan 2011 (doi: 10.1038/ismej.2010.196)

FURTHER READING Hibbing, M. E., Fuqua, C., Parsek, M. R. & Peterson, S. B. Bacterial competition; surviving and thriving in the microbial jungle. *Nature Rev. Microbiol.* **8**, 15–25 (2010)

