

Bacteria and Plants in Dialogue – New Insights

Department Microbe Plant Interaction

The question of how bacteria and plants communicate with each other and what advantages the two sides gain from this is being investigated by a number of GSF Institutes in the field of environment in the project 'Molecular interactions in the rhizosphere'. The focus of interest is on N-acylhomoserine lactones (AHL), a group of bacterial signal molecules that root-associated bacteria use to communicate with each other. AHL production is also widespread among human pathogenic bacteria. In addition to the density of the bacterial community, especially the spatial distribution plays a decisive role for communication. A 'calling distance' of up to 78 thousandths of a millimetre was identified on plant roots, more than 50 times the average bacterial cell size. In particular, the occurrence of cell aggregates is decisive for high rates of production of signal molecules. But plants also react to these bacterial signal molecules. The project was able to show that AHL molecules elicit plant defence reactions as well as systemic resistance to damaging fungi. The experimental data are supplemented by a mathematical model developed by GSF mathematicians and researchers which enables the actual amount of signal substances produced by the bacteria to be

determined in time and space, and the regulatory network involved to be analysed.

The knowledge gained on the communication of bacteria among each other and with other organisms offers a range of applications. In the area of health, new therapeutic substances may be possible based on the destruction of bacterial communication during pathogenesis. These promise a more sustainable effect than antibiotics because it is unlikely that resistance would be developed. In agriculture, one possible use that is being investigated intensively at the GSF in field experiments is the application of bacteria or their signal substances to control plant diseases or stimulate plant defence mechanisms.



Prof. Dr. Anton Hartmann

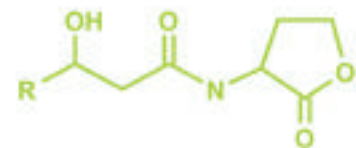
Department Microbe Plant Interaction

Telephone +49-89/31 87-41 09
anton.hartmann@gsf.de

Literature:

- Gantner S. et al.: FEMS Microbiol. Ecol. 56, 188-194 (2006).
- Schuhegger R. et al.: Plant Cell Environ. 29, 909-918 (2006).

Experimental determination of the distances between AHL-producing and AHL-detecting bacteria at the root surface using confocal laser scanning microscopy and geostatistical analysis.



N-Acylhomoserine lactone

