

Research team discovers new kind of signalling mechanism in plant cells

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Plants possess receptors which are similar to the glutamate receptors in the brain of humans and animals. Biochemists at the Ruhr-Universität Bochum (RUB) with colleagues from the University of Würzburg and the Agricultural University of China in Beijing have discovered that these receptors do not, however, recognise the amino acid glutamate, but many other different amino acids. The team reports in the journal *Science Signaling*.

Glutamate-like receptor in Arabidopsis recognises many amino acids

To exchange information, cells send out signalling molecules that are recognised by receptors of other cells. Fifteen years ago, researchers discovered glutamate-like receptors, in short GLRs, in a plant. A team led by the RUB biochemists Prof. Dr. Michael Hollmann and Dr. Daniel Tapken has now identified the respective signalling molecules for one of the, in total, 20 GLRs from the thale cress (*Arabidopsis thaliana*).

"Surprisingly, the receptor responds not only to one amino acid, but to many different ones – just not to glutamate", says Hollmann. The most effective is methionine, an amino acid that humans have to obtain from food, but which plants can produce themselves. When the research team mutated the plant so that it no longer contained the receptor AtGLR1.4, it hardly responded to methionine.

Plant receptor is an ion channel

In some respects, the receptor AtGLR1.4 behaves in a way similar to the glutamate receptors in the brain. It is a channel, so it opens – activated by a signalling molecule – a [pore](#) and allows various positively charged particles to flow into the cell, thus triggering an electrical signal. "A special feature of this receptor is that not all amino acids that bind to it trigger an [electrical signal](#). On the contrary! Some suppress the signal by displacing methionine from the receptor", says Daniel Tapken.

Function of methionine receptors in plants unclear

"Why the plant recognises methionine and similar amino acids at all is still absolutely unclear", the Bochum biochemist goes on. "One possibility is that it reacts in this way to nutrient sources in the environment that contain amino acids. However, it is also possible that the plant deliberately produces [amino acids](#) itself to send signals – similar to the way it happens in the human brain."

Receptors expressed in frog egg cells for analysis

For the analyses, the RUB team isolated the glutamate-like receptor from plant cells and implemented it in a cell that has no similar receptors – an unfertilised frog egg cell. "It is almost impossible to examine the receptor directly in the plant", Hollmann explains. "There are so many processes operating at the same time that it is extremely difficult to filter out the critical signals."

More information: Tapken, D. et al. (2013): A plant homolog of animal glutamate receptors is an ion channel gated by multiple hydrophobic amino acids, *Science Signaling*. [DOI: 10.1126/scisignal.2003762](https://doi.org/10.1126/scisignal.2003762)

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