



## ABSTRACT

### *“Tranceptor-mediated nitrate signaling in Arabidopsis”*

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Nitrate is not only a major nitrogen source for higher plants, but also a signal molecule governing both their physiology and development. Nitrate *per se* regulates the expression of several hundred genes in *Arabidopsis thaliana*, including those of its own acquisition and assimilation pathway. The signalling effect of nitrate is also particularly strong on root development, resulting in a high plasticity of the root system architecture in response to both spatial and temporal changes in external nitrate availability. Although the nitrate signalling pathways remain largely unknown at the molecular level, evidence is accumulating that the membrane nitrate transporter NRT1.1 (CHL1) may act as a nitrate sensor triggering transduction of the nitrate signal. NRT1.1 was first characterized as a dual-affinity influx carrier involved in root nitrate acquisition from the external medium. However, knock-out mutants for NRT1.1 (*chl1* mutants) display a strongly altered regulation by nitrate of other root nitrate transporters (e.g. NRT2.1, Muñoz et al. 2004, Krouk et al. 2006) and of root growth. Defective nitrate signalling in *chl1* plants cannot be explained by the loss of NRT1.1 nitrate transport activity. We showed that NRT1.1 participates in a specific nitrate signalling pathway, involving the putative transcription factor ANR1, and favouring preferential growth of lateral roots in nitrate-rich patches of the external medium (Remans et al. 2006). The actual role of NRT1.1 is to repress lateral root growth in nitrate-poor patches by preventing auxin accumulation in lateral root primordia and lateral root tips when the external nitrate concentration is low. Surprisingly, the strongest effect of NRT1.1 on auxin accumulation in lateral roots is found in the absence of nitrate. The mechanisms responsible for the control of local auxin gradients in lateral roots by NRT1.1 will be discussed, in connection with the observation that NRT1.1 may not transport only nitrate, but also auxin. Altogether, recent functional studies carried out by several groups indicate that, as evidenced for the so-called yeast transceptor proteins, NRT1.1 fulfils a dual transport/sensing role governing several responses on the plant to nitrate.

Muñoz S., Cazettes C., Fizames C., Gaymard F., Tillard P., Lepetit M., Lejay L., Gojon A. 2004 Transcript profiling in the *chl1-5* mutant of *Arabidopsis* reveals a role of the nitrate transporter NRT1.1 in the regulation of another nitrate transporter, NRT2.1. *Plant Cell* 16: 2433-2447.

Krouk G., Tillard P., Gojon A. 2006 Regulation of the high-affinity  $\text{NO}_3^-$  uptake system by NRT1.1-mediated  $\text{NO}_3^-$  demand signaling in *Arabidopsis*. *Plant Physiol.* 142: 1075-1086.

Remans T., Nacry P., Pervent M., Filleur S., Diatloff E., Mounier E., Tillard P., Forde B.G., Gojon A. 2006 The *Arabidopsis* NRT1.1 transporter participates in the signaling pathway triggering root colonization of nitrate-rich patches. *Proc. Natl. Acad. Sci. USA* 103 : 19206-19211.