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Nitric oxide is essential for cadmium-induced peroxule formation and peroxisome proliferation

Laura C. Terrón-Camero[1], María Rodríguez-Serrano[1], Luisa M. Sandalio[1], María C. Romero-Puertas[1].

Department de Biochemistry, Cell and Molecular Biology of Plants, Estación Experimental del Zaidin, CSIC, C/ Prof. Albareda 1, 18008 Granada, Spain

Abstract

Nitric oxide (NO) has been shown to be produced in peroxisomes, as well as its derivatives although their impact on the organelles remains elusive. To determine whether NO regulates peroxisomal dynamics under Cd stress, we generated double and triple NO-related mutants expressing CFP-SKL (*nox1xpx-ck* and *nia1 nia2xpx-ck*), which enabled us to follow the organelles by confocal microscopy. We have shown that NO production induced at the early plant response to Cd stress is involved in peroxules production, which is highly compromised in *nia1 nia2* mutants, with lower NO levels. Peroxisomal proliferation after Cd treatment analysed by electron microscopy and by the accumulation of the peroxisomal marker PEX14, does not occur in *nia1 nia2* mutants, phenotype that is recovered by NO. Ultrastructure analysis of peroxisomes showed that the number of the organelles in cells and oxidative metabolism is altered in both NO-related mutants. Furthermore, the pattern of oxidation and S-nitrosylation of CAT, one of the main antioxidant enzymes in the organelle, is altered under control and Cd conditions in NO-related mutants. Finally, we have analysed peroxisomal-dependent signalling, which is also affected in NO-related mutants. Our results show that NO must be tightly regulated for an optimal peroxisomal function and signalling.