

Alternative oxidase involvement in *Daucus carota* somatic embryogenesis

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ABSTRACT

Plant alternative oxidase (AOX) is a mitochondrial inner membrane enzyme involved in alternative respiration. The critical importance of the enzyme during acclimation upon stress of plant cells is not fully understood and is still an issue of intensive research and discussion. Recently, a role of AOX was suggested for the ability of plant cells to change easily its fate upon stress. In order to get new insights about AOX involvement in cell reprogramming, quantitative real-time polymerase chain reaction (PCR) and inhibitor studies were performed during cell redifferentiation and developmental stages of *Daucus carota* L. somatic embryogenesis. Transcript level analysis shows that *D. carota* AOX genes (*DcAOX1a* and *DcAOX2a*) are differentially expressed during somatic embryogenesis. *DcAOX1a* shows lower expression levels, being mainly down-regulated, whereas *DcAOX2a* presented a large up-regulation during initiation of the realization phase of somatic embryogenesis. However, when globular embryos start to develop, both genes are down-regulated, being this state transient for *DcAOX2a*. In addition, parallel studies were performed using salicylhydroxamic acid (SHAM) in order to inhibit AOX activity during the realization phase of somatic embryogenesis. Embryogenic cells growing in the presence of the inhibitor were unable to develop embryogenic structures and its growth rate was diminished. This effect was reversible and concentration dependent. The results obtained contribute to the hypothesis that AOX activity supports metabolic reorganization as an essential part of cell reprogramming and, thus, enables restructuring and de novo cell differentiation.

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