Ins and outs of Membrane Dynamics, when Acyl Chain Length does Matter

Jean-Denis Faure

Institut Jean-Pierre Bourgin, UMR1318 INRA-AgroParisTech, INRA Centre de Versailles-Grignon, Route de St. Cyr (RD10), 78026 Versailles Cedex France (faure@versailles.inra.fr)

Very long chain fatty acids (VLCFAs) are fatty acids with an acyl chain of 18 carbons and longer. They are elongated by the elongase complex in the endoplasmic reticulum and are incorporated into four major lipid pools (triacylglycerols, waxes, phospholipids, complex sphingolipids) (1). Functional analysis of several components of the elongase complex demonstrated the essential role of VLCFAs in plants, invertebrates and vertebrates. Identification of the acetyl-CoA carboxylase PASTICCINO3 and the 3-hydroxy acyl-CoA dehydratase PASTICCINO2 revealed that VLCFAs are important for cell proliferation and tissue patterning (2, 3) but also for cytokinesis (4). VLCFA elongation also required the ER-localized immunophilin *PASTICCINO1* (*PAS1*) and that *PAS1* impairment resulted in defective polar auxin transport and tissue patterning during plant development (5). Interestingly, very long acyl chains are major components of sphingolipids that are essential for vesicular trafficking and cell polarity in yeast and mammals. A key step of sphingolipid biosynthesis is the acylation of long chain bases catalyzed by the sphingoid base N-acyl transferase or Ceramide synthase. Genetic and pharmacological analysis of VLCFA-ceramide synthase activity revealed several developmental defects realted to defective polar auxin transport. These defects were associated with specific modification of subcellular trafficking and membrane dynamics (6). The specific role of acyl chain length of membrane lipids in vesicular trafficking and cell polarity during plant development will be discussed.

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