Synopsis of Original Research Paper

The roles of the characteristic fatty acid composition of phosphatidylinositol in the homeostasis of skin

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Phosphatidylinositol (PI) is a versatile lipid that not only serves as a structural component of cellular membranes, but also plays important roles in signal transduction through distinct phosphorylated derivatives of the inositol head group. PI contains stearic acid (18:0) as the predominant fatty acid at the *sn*-1 position. This fatty acid composition is formed through fatty acid remodeling by sequential deacylation and reacylation. We previously identified acyltransferases responsible for the incorporation of stearic acid into the *sn*-1 position of PI in *C. elegans* (*acl-8, acl-9* and *acl-10*) and mice (*lycat*). However, the biological significance of the enrichment of stearic acid at the *sn*-1 position of PI is largely unknown. In this study, we analyzed the phenotypes of *acl-8 acl-9 acl-10* triple mutants in *C. elegans* and found that the epithelial morphology was disrupted. The mutants showed defects in the amount and localization of actin filaments at the apical junction of epithelial cells. In addition, PI(4,5)P2 was significantly accumulated at the apical junction of epithelial cells. Furthermore, our genetic screen identified the ether lipid biosynthetic pathway genes *acl-7/DHAPAT* and *ads-1/AGPS* as suppressor genes of *acl-10* mutants. We found that *acl-7* mutation rescued both the reduced amount of stearic acid at the *sn*-1 position of PI and the defects at the apical junction of epithelial cells in *acl-8 acl-9 acl-10* triple mutants. Taken together, these results indicate the important role of stearic acid in the *sn*-1 position of PI in the epithelial cell integrity through proper actin filament organization.