Remodeling of Phosphatidylglycerol in *Synechocystis* PCC6803

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Remodeling of lipids by manipulating fatty acid composition is one of potential factors involved in the adaptation to environmental stresses. However, this metabolic process has not been well understood. The phosphatidylglycerol deficient Δ*pgsA* mutant of *Synechocystis* PCC6803 provided a unique experimental system for investigating *in vivo* retailoring of exogenously added dioleoylphosphatidylglycerol in phosphatidylglycerol-depleted cells. Gas chromatographic analysis of fatty acid composition suggested that natural diacyl-phosphatidylglycerols were synthesized from the artificial synthetic precursor. The formation of new, retailored lipid species was confirmed by negative-ion electrospray ionization–Fourier-transform ion cyclotron resonance and ion trap tandem mass spectrometry. Various isomeric diacyl-phosphatidylglycerols were identified indicating transesterification of the exogenously added dioleoylphosphatidyl-glycerol at the *sn*-1 or *sn*-2 positions. Polyunsaturated fatty acids were incorporated selectively into the *sn*-1 position. Our experiments with *Synechocystis* PCC6803/Δ*pgsA* mutant cells demonstrated remodeling of lipids in a prokaryotic photosynthetic bacterium and implicated a biosynthetic pathway involving phospholipase A_1 and A_2, acyl hydrolise lysophosphatidylglycerol acyltransferase and acyl-lipid desaturases for such a remodeling of diacylphosphatidylglycerol molecules.