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Cyanobacterial high-light-inducible proteins - protectors of chlorophyll-protein synthesis and assembly

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Abstract

Cyanobacteria contain a family of genes encoding one-helix high-light-inducible proteins (Hlips) that are homologous to light harvesting chlorophyll *a/b*-binding proteins of plants and algae. Based on various experimental approaches, a spectrum of functions that includes regulation of chlorophyll biosynthesis, transient chlorophyll binding, quenching of singlet oxygen and non-photochemical quenching of absorbed energy is ascribed to these proteins. However, these functions had not been supported by conclusive experimental evidence until recently when it became clear that Hlips are able to quench absorbed light energy and assist during terminal step(s) of the chlorophyll biosynthesis and early stages of Photosystem II assembly. In this review we summarize and discuss the present knowledge about Hlips and provide a model of how individual members of the Hlip family operate during the biogenesis of chlorophyll-proteins, namely Photosystem II.

Abbreviations:

β-car, β-carotene; Cab, chlorophyll *a/b* binding; Chl, chlorophyll; Chlide, chlorophyllide; CP43m, CP47m, D1m and D2m, CP43, CP47, D1 and D2 assembly modules, respectively; Elip, early light-induced protein; FeCh, ferrochelatase; Hlip, high-light-inducible protein; Lhc, light-harvesting complex; Lil, Lhc-like proteins; Ohp, one-helix protein; Pchlide, protochlorophyllide; Proto, protoporphyrin IX; PSI, photosystem I; PSII, photosystem II; RC, reaction center; Scp, small Cab-like protein; Sep, stress-enhanced protein.

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