Psb35 Protein Stabilizes the CP47 Assembly Module and Associated High-Light Inducible Proteins during the Biogenesis of Photosystem II in the Cyanobacterium Synechocystis sp. PCC6803

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Photosystem II (PSII) is a large membrane protein complex performing primary charge separation in oxygenic photosynthesis. The biogenesis of PSII is a complicated process that involves a coordinated linking of assembly modules in a precise order. Each such module consists of one large chlorophyll (Chl)-binding protein, number of small membrane polypeptides, pigments and other cofactors. We isolated the CP47 antenna module from the cyanobacterium Synechocystis sp. PCC 6803 and found that it contains a 11-kDa protein encoded by the ssl2148 gene. This protein was named Psb35 and its presence in the CP47 module was confirmed by the isolation of FLAG-tagged version of Psb35. Using this pulldown assay, we showed that the Psb35 remains attached to CP47 after the integration of CP47 into PSII complexes. However, the isolated Psb35-PSIIs were enriched with auxiliary PSII assembly factors like Psb27, Psb28-1, Psb28-2 and RubA while they lacked the lumenal proteins stabilizing the PSII oxygen-evolving complex. In addition, the Psb35 co-purified with a large unique complex of CP47 and photosystem I trimer. The absence of Psb35 led to a lower accumulation and decreased stability of the CP47 antenna module and associated high-lightinducible proteins but did not change the growth rate of the cyanobacterium under the variety of light regimes. Nevertheless, in comparison with WT, the Psb35-less mutant showed an accelerated pigment bleaching during prolonged dark incubation. The results suggest an involvement of Psb35 in the life cycle of cyanobacterial Chl-binding proteins, especially CP47.