The Psb34 protein modulates binding of high-light-inducible proteins to CP47-containing photosystem II assembly intermediates in the cyanobacterium Synechocystis sp. PCC 6803

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Assembly of Photosystem II (PSII), a water-splitting catalyst in chloroplasts and cyanobacteria, requires numerous auxiliary proteins which promote individual steps of this sequential process and transiently associate with one or more assembly intermediate complexes. In this study, we focused on the role of a PSII-associated protein encoded by the *ssl1498* gene in the cyanobacterium *Synechocystis* sp. PCC 6803. The protein which we call here Pasb34, was identified in both dimeric and monomeric PSII as well as in a PSII monomer lacking CP43. When provided with FLAG-tag, the protein co-isolates with these three complexes. The N-terminus of Psb34 is very similar to the N-terminus to HliA/B proteins belonging to a family of high-light inducible proteins. Consequently, Psb34 and Hlips appear to compete for the similar binding site. FLAG-Psb34 associated PSII complexes lack Hlips even when isolated from high-light-exposed cells. FLAG-Psb34-PSII also contains previously characterized PSII auxiliary proteins like Psb27 and Psb28 but also the oxygen evolving enhancers PsbO and PsbV. This suggests that Psb34 is component of latest PSII assembly intermediates and accompanies their conversion into the functional oxygen-evolving complexes, possibly keeping them free of Hlips. The Psb34-less mutant accumulates Hlips even under non-stress conditions and growth of the double Psb34/HliA mutant is slowed down under intermittent illumination. Since unlike Psb34 the HliA/B proteins bind to CP47 before its incorporation into PSII, the results also indicate that Psb34 mediates the optimal equilibrium of HliA/B binding among individual PSII assembly intermediates containing CP47 for their maximal protection.