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Irina V. Elanskaya, Dmitry V. Zlenko, Evgeny P. Lukashev, Natalya E. Suzina, Irena A. Kononova, Igor N. Stadnichuk

PII: S0005-2728(18)30003-3
DOI: doi:10.1016/j.bbabio.2018.01.003
Reference: BBABIO 47862

To appear in: *BBA - Bioenergetics*

Received date: 23 August 2017
Revised date: 22 December 2017
Accepted date: 16 January 2018

Please cite this article as: Irina V. Elanskaya, Dmitry V. Zlenko, Evgeny P. Lukashev, Natalya E. Suzina, Irena A. Kononova, Igor N. Stadnichuk, Phycobilisomes from the Mutant Cyanobacterium *Synechocystis* sp. PCC 6803 Missing Chromophore Domain of ApcE, *BBA - Bioenergetics* (2018), doi:10.1016/j.bbabio.2018.01.003

Phycobilisomes from the Mutant Cyanobacterium *Synechocystis* sp. PCC 6803 Missing Chromophore Domain of ApcE

Irina V. Elanskaya[a], Dmitry V. Zlenko[a], Evgeny P. Lukashev[a], Natalya E. Suzina[b], Irena A. Kononova[a], Igor N. Stadnichuk[c]

[a]*Biological faculty of M.V.Lomonosov Moscow State University, 119992 Moscow, Russia*
[b]*K.G.Skryabin Insitute of Biochemistry and Physiology of Microorganisms, Russian Academy of Sciences, 142290 Puschino, Moscow Region, Russia*
[c]*K.A.Timiryazev Institute of Plant Physiology, Russian Academy of Sciences, 127276 Moscow, Russia*

Abstract

Phycobilisome (PBS) is a giant photosynthetic antenna associated with the thylakoid membranes of cyanobacteria and red algae. PBS consists of two domains: central core and peripheral rods assembled of disc-shaped phycobiliprotein aggregates and linker polypeptides. The study of the PBS architecture is hindered due to the lack of the data on the structure of the large ApcE-linker also called L_{CM}. ApcE participates in the PBS core stabilization, PBS anchoring to the photosynthetic membrane, transfer of the light energy to chlorophyll, and, very probably, the interaction with the orange carotenoid protein (OCP) during the non-photochemical PBS quenching. We have constructed the cyanobacterium *Synechocystis* sp. PCC 6803 mutant lacking 235 N-terminal amino acids of the chromophorylated PBL_{CM} domain of ApcE. The altered fluorescence characteristics of the mutant PBSs indicate that the energy transfer to the terminal emitters within the mutant PBS is largely disturbed. The PBSs of the mutant become unable to attach to the thylakoid membrane, which correlates with the identified absence of the energy transfer from the PBSs to the photosystem II. At the same time, the energy transfer from the PBS to the photosystem I was registered in the mutant cells and seems to occur due to the small cylindrical CpcG2-PBSs formation in addition to the conventional PBSs. In contrast to the wild type *Synechocystis*, the OCP-mediated non-photochemical PBS quenching was not registered in the mutant cells. Thus, the PBL_{CM} domain takes part