

IS2.3 - Competition between differentially expressed enzymes controls light color acclimation in marine *Synechococcus*

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Marine *Synechococcus*, a globally important group of cyanobacteria, thrives in various light niches in part due to its varied photosynthetic light harvesting pigments. Many *Synechococcus* strains use a process known as Type 4 chromatic acclimation (CA4) to optimize the ratio of two chromophores, green-light absorbing phycoerythrin (PEB) and blue-light absorbing phycourobilin (PUB), within their light harvesting complexes. *Synechococcus* sp RS9916, a strain capable of CA4 acquired a genomic island (1) which encodes PUB lyase-isomerase MpeZ (2) and two master regulators, FciA and FciB (3). A full mechanistic understanding of how *Synechococcus* cells tune their PEB to PUB ratio during CA4 has not yet been obtained.

Here, we show that competition between two enzymes named MpeY and MpeZ controls differential PEB and PUB covalent attachment to the same cysteine residue (C83 on MpeA or α -phycoerythrin II). MpeY attaches PEB to the light harvesting protein α -phycoerythrin-II in green light, while MpeZ attaches PUB to phycoerythrin-II in blue light. We demonstrate that the ratio of *mpeY* to *mpeZ* mRNA determines if PEB or PUB is attached. Additionally, strains encoding only MpeY or MpeZ do not acclimate. Examination of strains of *Synechococcus* isolated from across the globe indicates that the competition between MpeY and MpeZ uncovered here is a critical feature of chromatic acclimation for marine *Synechococcus* worldwide. (This research was supported by National Science Foundation Grants to D.M.K. (MCB-1029414) and to W.M.S. (MCB-1244339).

References:

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