Disruption of cyanobacterial phytochrome alters phototaxis for far-red light in Cyanobacterium *Synechocystis* sp. PCC 6803

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Plant phytochromes are well-known photoreceptor molecules absorbing red and far-red light, which regulate the developmental photomorphogenesis. Recently, cyanobacterial phytochrome, CphI, was found to be a light-regulated histidine kinase of two component system. When exposed to far-red light, CphI is auto-phosphorylated at the histidine site and subsequently phosphorylate RcpI, a response regulator (K-C. Yeh *et al.,* Science 277 (1997): 1505-1508). To examine *in vivo* function of Cph1, we disrupted *cph1* gene by targeted mutagenesis. The *cphI* knockout mutant (Δ*cph1)* showed the phototaxis toward white light and red light at the same fluence rate of 10 *u*mol/m^2/s as wild type cells did. However, the mutant was strikingly insensitive only to far-red light at the same fluence rate. This result indicates that CphI is responsible for sensing far-red light exclusively in the phototaxis. In addition, wild type cells lose phototaxis at the stimulus far-red light under the background of red light at 10 umol/m2/s. When the intensity of background red light is decreasing to 1 *u*mol/m^2/s, wild type cells showed the phototaxis to the stimulus far-red light. These data provide the first evidence that CphI is *in vivo* functional phytochrome, in which red-light absorbing phtochrome (Pr form) is an active phytochrome for the cyanobacterial phototaxis.