Physiological and Molecular Characterization of a *Synechocystis* sp. PCC 6803 Mutant Lacking Histidine Kinase Slr1759 and Response Regulator Slr1760

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The hybrid sensory histidine kinase Slr1759 of the cyanobacterium *Synechocystis* sp. strain PCC 6803 contains multiple sensory domains and a multi-step phosphorelay system. Immuno blot analysis provided evidence that the histidine kinase Slr1759 is associated with the cytoplasmic membrane. The gene *slr1759* is part of an operon together with *slr1760*, encoding a response regulator. A comparative investigation was performed on *Synechocystis* sp. strain PCC 6803 wild type (WT) and an insertionally inactivated *slr1759*-mutant (Hik14) which also lacks the transcript for the response regulator Slr1760. The mutant Hik14 grew significantly slower than WT in the early growth phase, when both were inoculated with a low cell density into BG11 medium without additional buffer and when aerated with air enriched with 2% CO_2. Since the aeration with CO_2-enriched air results in a decrease of the pH value in the medium, the growth experiments indicated that Hik14 is not able to adjust its metabolic activities as rapidly as WT to compensate for a larger decrease of the pH value in the medium. No significant differences in growth between Hik14 and WT were observed when cells were inoculated with a higher cell density in BG11 medium or when the BG11 medium contained 50 mM Epps-NaOH, pH 7.5, to prevent the pH drop. This Hik14 phenotype has so far only been seen under the above defined growth condition. Results of photosynthetic activity measurements as well as Northern blot-, immuno blot-, and metabolite analyses suggest that the two-component system Slr1759/Slr1760 has a function in the coordination of several metabolic activities which is in good agreement with the complex domain structure of Slr1759. The direct targets of this two-component system have so far not been identified.

Key words: Synechocystis sp. PCC 6803, Two-Component System, Histidine Kinase