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STRUCTURE AND FUNTION OF CYANOBACTERIAL NDH-1COMPLEXES

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The expression, interaction and membrane location of multifunctional NAD(P)H dehydrogenase (NDH-1) complexes and their involvement in carbon acquisition, cyclic photosystem I and respiration were investigated using the wild type (WT) and specific *ndh*gene knockout mutants of *Synechocystis* sp. PCC 6803 grown under different CO2and pH conditions, followed by a proteome analysis of their membrane protein complexes. Typical NDH-1 complexes were represented by NDH-1L (large) and NDH-1M (medium size),located in the thylakoid membrane. The NDH-1L complex, missing from the NdhD1/D2 mutant, was a prerequisite for photoheterotrophic growth and thus apparently involved in cellular respiration. The amount of NDH-1M and the rate of P700+ re-reduction in darkness in the NdhD1/D2 mutant grown at low CO2 were similar to those in WT, whereas in the M55 mutant (NdhB), lacking both NDH-1L and NDH-1M, the rate of P700+ re-reduction was very slow. The NDH-1S (small) complex, localised to the thylakoid membrane and composed of only NdhD3, NdhF3, CupA and Sll1735, was strongly induced at low CO2 in WT as well as in NdhD1/D2 and M55. In contrast to WT and NdhD1/D2, which show normal CO2 uptake, M55 is unable to take up CO2 even when the NDH-1S complex is present. Conversely, the NdhD3/D4 mutant, also unable to take up CO2, lacked NDH-1S but exhibited wild type levels of NDH-1M at low CO2. These results demonstrate that both NDH-1S and NDH-1M are essential for CO2 uptake and that NDH-1M is a functional complex. We also show that the Na+/HCO3-transporter (SbtA complex) is located in the plasma membrane and is strongly induced in the WT and mutants at low CO2.