# Chloride Influence on Electron Transfer in Photosystem II of *Limnospira maxima*

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The role of dissolved inorganic carbon (DIC) on the donor side of Photosystem II (PSII) is postulated to be associated with proton removal, a process facilitated by chloride ions. Chloride ions are posited to facilitate proton removal from the water-oxidizing complex (WOC) through specific "water channels" to the lumen. Structural studies have confirmed the presence of chloride at consistent sites near the WOC, where they are essential for proper PSII function and proton release. The mechanism by which chloride ions influence PSII function is not fully resolved, though studies using anion substitution, such as replacing chloride with bromide, provide insight into their roles in proton transfer and PSII stability. The hypercarbonate-requiring filamentous cyanobacterium *Limnospira maxima* was used to investigate the broader effects of chloride's role in PSII. 77K spectrofluorometry suggests substitution of chloride results in less exciton transfer from the phycobilisome to PSII due to proportional increase of fluorescence emission from allophycoyanin. Chlorophyll fast repetition rate fluorometry revealed less efficient PSII operation under bromide compared to chloride. $Q_A$- reoxidation kinetics suggest that substitution results in fewer $Q_B$ sites remaining in the semiquinone state, with more sites either empty or fully reduced. This effect may be due to bromide's influence and proton removal from the WOC. Overall, electron transfer from $Q_A^-$ to $Q_B$ and $Q_A^-$ to $Q_B^-$ is faster compared to native *L. maxima*. P700 redox kinetics reveal that under bromide conditions, there is an increase in electron on plastocyanin (PC) and PSI, while under chloride conditions PC experiences less oxidation.