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Structural Analysis Uncovers a Role for Redox in Regulating FKBP13, An Immunophilin of the Chloroplast Thylakoid Lumen. Kunchithapadam Swaminathan^{1,2}, Gayathri Gopalan¹, ¹Dept. of Biological Sciences, National Univ. of Singapore; ²Inst. of Molecular and Cell Biology, Singapore.

Change in redox status is known to link light to the posttranslational regulation of chloroplast enzymes. So far, studies have been conducted primarily with thioredoxin-linked members of the stroma that function in a broad array of biosynthetic and degradatory processes. Little is known about the role of redox in regulating the enzymes found to occur in the lumen, the site of oxygen evolution in thylakoid membranes. We have studied AtFKBP13, an FKBP-type immunophilin earlier shown to interact with a redox-active protein of the lumen, and found the enzyme to contain a pair of disulfide bonds in X-ray structural studies. These disulfides, which are essential for the associated peptidyl-prolyl isomerase activity, are unique to chloroplast FKBP s and are absent in animal and yeast counterparts. Both disulfide bonds were redox-active and were reduced by thioredoxin in a reaction that led to loss of enzyme activity. We suggest a previously unrecognized paradigm for redox regulation in chloroplasts in which activation by light is achieved in concert with oxygen evolution by the oxidation of sulfhydryl groups (conversion of SH to S—S).

Gopalan et al. (2004). *PNAS*, **101**, 13945-13950.