

Research Highlights

Photosynthesis: New model of the quality control of Photosystem II

Thylakoid membranes are piled up to form the grana well known as the site where the Photosystem II (PSII) complexes which play a role in the primary photochemical reaction exist. However, the structures and dynamics of thylakoid membranes are still unclear. In higher plants, the D1 protein binding to the reaction center of PSII is easily damaged by strong light, which leads the decrease of photosynthetic efficiency. The damaged D1 protein is removed immediately by FtsH proteases located near the PSII, and the newly synthesized D1 protein is inserted in the D1-depleted PSII complex. This maintenance system keeps photosynthetic activity under light stress.

Now, it has been revealed that the molecular process of quality control of PSII described above has a close relationship with the structural changes of thylakoid membranes. M. Y.-Nishimura and Y. Yamamoto at Okayama University proposed the new model of the quality control of PSII focused on the structure of thylakoid membranes.

Under normal conditions, FtsH proteases do not migrate easily on the thylakoid membranes because of the narrow space of the partition gap of grana. When thylakoid membranes are subjected to excessive light, the stacks of thylakoid membranes were found to be unstacked. This structural change of the thylakoid membranes is helpful for the migration of the FtsH proteases to access the damaged D1 protein. In the future, more investigations about the structure of thylakoid membranes will be needed for the complete understanding of the dynamics in the quality control of PSII.

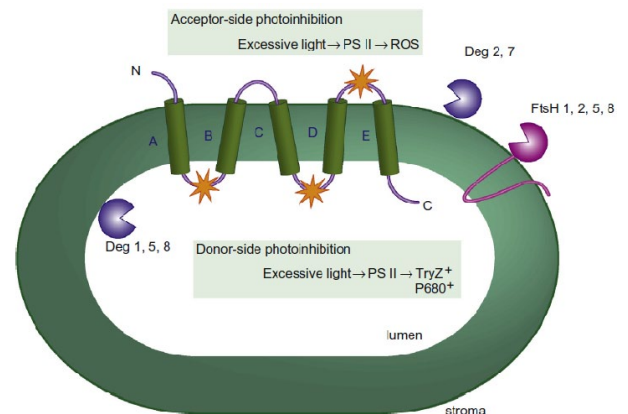


Figure caption: Degradation of the D1 protein by proteases.

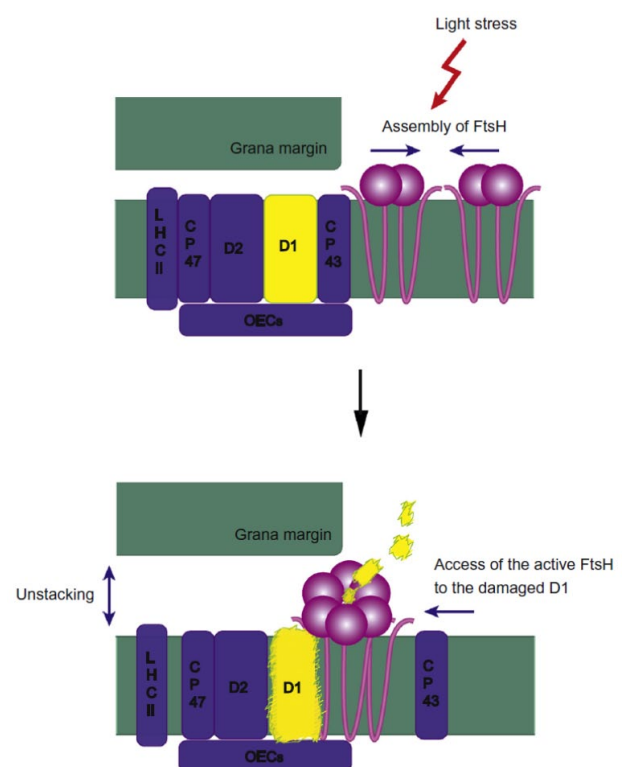


Figure caption: Unstacking of the thylakoid membranes.

Reference:

- Authors: Miho Yoshioka-Nishimura, Yasusi Yamamoto.
- Title of original paper: Quality control of Photosystem II: The molecular basis for the action of FtsH protease and the dynamics of the thylakoid membranes.
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