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Femtosecond pump-probe spectroscopy on wild-type and mutant antenna complexes from Arabidopsis thaliana

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Abstract content
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When exposed to high levels of solar radiation, plants and other oxygenic photosynthetic organisms have to dissipate excess absorbed photoenergy which would otherwise lead to the formation of reactive oxygen species and subsequently damage the light harvesting apparatus. The process by which excess excitation energy is harmlessly dissipated from the pigment-protein light harvesting complexes in the form of heat is known as qE and constitutes the major and fastest component of a complex feedback mechanism generally known as non-photochemical quenching (NPQ). Different models have been suggested to explain the molecular mechanism behind qE in the light harvesting complexes of higher plants. The role of specific carotenoid pigments in the process is still not entirely understood. We have tested the involvement of the carotenoid neoxanthin in the process of qE by carrying out femtosecond pump-probe spectroscopy on wild-type and NPQ2 mutant LHC II complexes. NPQ2 mutants do not contain neoxanthin; hence analysis of the data from the different samples should help shed light on the eventual involvement of this carotenoid in quenching activation. The pump pulse energy in the measurements was set at 5 nJ to avoid both singlet-singlet and singlet-triplet annihilation. We applied global and target analysis to the data to determine the excitation energy transfer that occurs between the different pigments that constitute LHC II. Here I will present the results obtained after using pump excitations at 488 and 509 nm (i.e. carotenoid-specific excitations) on the two different samples in the solubilized state. Our preliminary results indicate the involvement of neoxanthin in actively transferring excitation energy to chlorophyll b molecules.

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