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Ultrafast energy transfer and photoprotection in the light-harvesting complexes of the diatom *Cyclotella meneghiniana*

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Abstract content
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Diatoms are unicellular marine photosynthetic organisms characterized by their silica shell. Their light harvesting complexes are named fucoxanthin-chlorophyll protein (FCP). Besides efficient absorption and rapid subsequent transfer of photoenergy to the photochemical reaction centre, FCP complexes are also strongly involved in photoprotection, a complex series of events known as non-photochemical quenching (NPQ) by which plants and algae dissipate excess absorbed energy that would otherwise damage the photosystems. Diatoms exhibit considerably stronger NPQ than plants. The diatom *Cyclotella meneghiniana* possesses two types of light-harvesting complexes, known as FCPa and FCPb, which differ primarily in their protein compositions. In this study we used femtosecond transient absorption spectroscopy to investigate the energy transfer dynamics and thermal energy dissipation pathways in FCPb at the last energy transfer stage. Two different pump energies at 680 nm excitation were used. The effect of the environment surrounding the protein was investigated by comparing the behavior of solubilized FCPb (sFCPb) with that of FCPb incorporated into proteoliposomes (pIFCPb), the latter of which serve as a model system for the study of membrane-bound enzymes and transport proteins. The results show that, while the fluorescence of the pIFCPb sample is quenched relative to sFCPb, it appears to exhibit less annihilation than sFCPb, suggesting that the proteoliposome samples may be a new model system to study NPQ mechanisms in these complexes.

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