

OA3.7 - Conformational dynamics of a photosynthetic light-harvesting complex in native thylakoid membranes

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Abstract

Photosynthetic light-harvesting antenna complexes (LHCs) of plants, moss and green algae form dynamic switches between light harvesting and excitation-quenched, dissipative states. This mechanism protects the photosynthetic apparatus under light stress via a photo protective membrane response. Herein, we demonstrate the application of solid-state NMR spectroscopy to wild type, heterogeneous thylakoid membranes of *Chlamydomonas reinhardtii* (*Cr*) and purified *Cr* Light harvesting Complex II (LHCII) reconstituted in thylakoid lipid membranes, to detect the conformational dynamics of LHCII under native conditions. We find that membrane-reconstituted LHCII contains sites that undergo fast, large-amplitude motions, including the phytol tails of two chlorophylls. Furthermore, plasticity is observed in the N-terminal stretch and in the trans-membrane helical edges facing the thylakoid lumen. In intact thylakoids, the dynamics of these protein and pigment sites is significantly reduced. We conclude that LHCII contains flexible sites but that their conformational dynamics are constrained *in vivo*, implying that changes in the physicochemical environment are required to enable switching between different conformational states. *In situ* NMR spectroscopy opens a new route to investigate the plasticity of light-harvesting complexes and their seminal role in biological regulation mechanisms such as membrane state transitions, non-photochemical quenching or post-translational modifications.

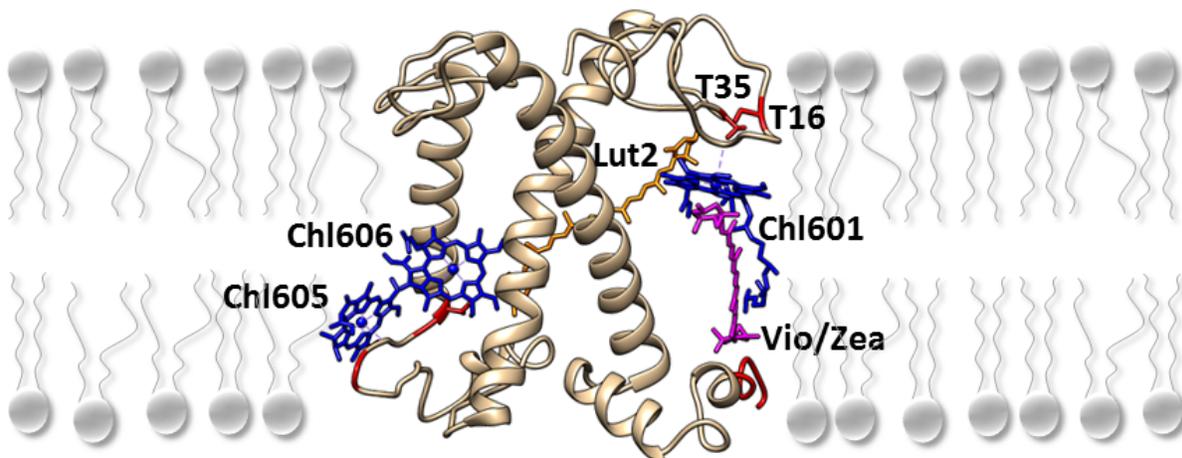


Figure 1 Structure of LHCII in lipid bilayer. Predicted sites with strong dynamics in LHCII in liposomes are highlighted in red and pigments in close vicinity are indicated. Chl605 and Chl606 have dynamic phytol chains. The dynamics is reduced in LHCII in native thylakoid membranes.