

Elucidation of the Photoprotective Mechanisms in Algal Light Harvesting

Gabriela S. Schlau-Cohen

In photosynthetic light harvesting, absorbed energy migrates through a protein network to reach a dedicated location for conversion to chemical energy. In green algae, this energy flow is efficient, directional, and regulated. The regulatory response involves complex and complicated multi-timescale processes that safely dissipate excess energy, thus protecting the system against deleterious photoproducts. We explore the mechanisms behind this photoprotective process in a light-harvesting complex implicated in dissipation, light-harvesting complex stress response (LHCSR). By characterizing the conformational states and dynamics of individual proteins, we identify the extent of energy dissipation in single LHCSR proteins and how the extent of dissipation changes in response to pH and carotenoid composition, two components known to play a role in photoprotection. From this information, we explore how individual complexes contribute to the balance between efficiency and adaptability in photosynthetic light harvesting.