Antenna quenching by the Orange carotenoid protein: Structure meets the dynamics.

Tomáš Polívka Prof., RNDr., Ph.D.

Laboratoryof Optical Spectroscopy, Faculty of Science, University of South Bohemia, České Budějovice

http://www.polivkalab.cz/en_people.html

Abstract:

Phycobilisomes (PBS) are the elaborated light-harvesting antennas in cyanobacteria. To balance the harvesting of light energy against the risks of photodamage, many cyanobacteria have evolved a photoprotective mechanism that relies on the interaction between a photoreceptor, the Orange Carotenoid Protein (OCP), and the PBS. Recent structure of the PBS-OCP complex provided a basis for understanding the quenching mechanism by which OCP regulates energy flow through the PBS-OCP complex. The high resolution structure (1.6-2.1 A) allowed to reveal intricate network of interactions between the carotenoid canthaxanthin, the key pigment in OCP responsible for quenching, and amino acid residues in OCP and PBS. Combination of quantum chemistry and kinetic modeling of energy transfer identified the key protein residues making canthaxanthin's transition dipole moment in its lowest-energy dark state large enough for efficient energy transfer from phycocyanobilins. The energy transfer model offers a detailed understanding of the atomic determinants of light harvesting regulation in cyanobacteria.