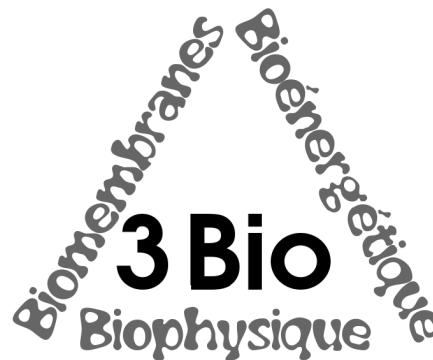


Séminaire du Service de Bioénergétique,
Biologie Structurale et Mécanismes
CEA/Saclay
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Playing with Chl a fluorescence; a nearly complete description of the fluorescence rise OJIP

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The fluorescence rise (OJIP) reflects the stepwise reduction of the photosynthetic electron transport chain on a dark-to-light transition. We have evaluated nearly all the processes that have been associated with the fluorescence rise under in vivo conditions using simultaneous 820 nm transmission measurements to discriminate between redox changes and fluorescence yield changes. We created an interpretation framework within which there is a place for all these phenomena: photosystem II (PSII) heterogeneity, relationship with the properties of the photosynthetic electron transport chain, the role of the activation state of ferredoxin NADP⁺ reductase (FNR), differences between different photosynthetic organisms. For a few processes, though, the conclusion was that they either did not exist under in vivo conditions (e.g. PQ-pool quenching), or that the interpretation should be modified (the fluorescence quenching parameter qT can be better explained as a measure for the inactivation of FNR). The implication of these studies was as well that the assumption that QA is the dominant factor determining the fluorescence rise could not explain everything and we proposed recently that 30% of the fluorescence rise (the thermal phase) is due to a fluorescence yield change induced by a light induced conformational change. In this interpretation, PSII β -centers are an expression of this fluorescence yield change and unrelated to PSII heterogeneity. The conformational change concept can explain the fact that with chl a fluorescence we can probe the whole electron transport chain and not just the environment of QA and as well the observation that it is impossible to reach FM in the light adapted state. We have further used our knowledge to design assays to determine PQ-pool oxidase activity, estimate the content of inactive PSII reaction centers, probe ascorbate in the lumen, determine the inactivation kinetics of FNR on a light-to-dark transition, etc.

Selected references

Schansker G, Tóth SZ and Strasser RJ (2005) Methylviologen and dibromothymoquinone treatments of pea leaves reveal the role of photosystem I in the Chl a fluorescence rise OJIP. *Biochim Biophys Acta* 1706: 250–261

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Schansker G, Tóth SZ, Kovács L, Holzwarth AR and Garab G (2011) Evidence for a fluorescence yield change driven by a light-induced conformational change within photosystem II during the fast chlorophyll a fluorescence rise. *Biochim Biophys Acta* 1807: 1032–1043

Invitation: Anja KRIEGER

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