ABSTRACT

"Plastoglobules and their ABC1 Kinases in Arabidopsis thaliana"

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Plastoglobules (PG) are plastid lipid-protein particles with a small specialized proteome and metabolome. In my talk I will provide evidence that PG function as thylakoid microdomains facilitating concentration of metabolites and proteins to accommodate metabolic channeling and higher flux rates, as well as signal transduction.

We constructed a comprehensive functional model of the PG based on co-expression analysis using identified PG proteins as baits. The resulting co-expression network implicated four specific functions for the PG: i) senescence, ii) plastid biogenesis, iii) prenyl-lipid metabolism, and iv) redox/photosynthetic regulation. Among the 30 PG proteins are six proteins of the ancient ABC1 atypical kinase (ABC1K) family and their locations in the co-expression network suggested important regulatory roles. Algae and higher plants have typically more than 16 ABC1Ks members, where they localize to plastids and mitochondria. We hypothesized that targets of ABC1Ks include enzymes of prenyl-lipid metabolism as well as components of the organellar gene expression machineries. Loss of function mutants for PG-localized ABC1K1 and ABC1K3 in Arabidopsis thaliana show conditional senescence-like phenotypes, involving degradation of the PSII core and upregulation of chlorophyll degradation. The senescence-like phenotype was independent of the EXECUTER pathway and correlated with increased levels of the 1O2-derived carotenoid β-cyclocitral, a retrograde plastid signal. Metabolite and proteome analyses show that ABC1K1/3 contribute to PG function in prenyl-lipid metabolism, stress response and thylakoid remodeling, and contribute to cross-talk between the thylakoid and the Calvin cycle.

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