

# Séminaire de Biologie des Plantes

Les séminaires ont lieu sur le Campus Agro-M/INRA de La Gaillarde (2, place P. Viala Montpellier)

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Jeudi 14 février 2008

Amphi 206 (Cœur d'Ecole) à 14h00

Marinus Pilon

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## Copper Delivery for Photosynthesis: Transporters, Metallo-Chaperones and Regulation by Small RNA

About a third of all proteins require a metal ion cofactor for activity. The growth environment often limits the availability of metal cofactors. Under limitation cells must prioritize delivery to specific targets and coordinate delivery with apo-protein expression as well as varying metabolic demand. Targets for copper (Cu) delivery in plant chloroplasts are plastocyanin in the thylakoids and Cu/Zn-superoxide dismutase (Cu/ZnSOD) in the stroma. *PAA1* and *PAA2* encode Cu-transporting P-type ATPases in the chloroplast. Characterization of *paa1* and *paa2* mutants showed that the two transporters have distinct functions. Both transporters are required for Cu delivery to plastocyanin and efficient photosynthetic electron transport. However, Cu delivery to the stroma is only inhibited in *paa1* but not in *paa2* mutants. Localization experiments indicated that both transporters function in chloroplasts and that the PAA1 protein is in the chloroplast periphery whereas PAA2 functions in the thylakoids. A *paa1 paa2* double mutant was seedling lethal and could not be rescued by Cu feeding. A third component of the Cu delivery system in chloroplasts is CCS, a Cu-chaperone that delivers Cu to Cu/ZnSOD. Next to Cu/ZnSOD, plants have a FeSOD in the chloroplast. Interestingly, Cu availability regulates the activity of the SOD isoforms and the CCS metallo-chaperone. At low Cu levels, the FeSOD is active and Cu/ZnSOD and CCS expression is shut off, so that Cu is preferentially targeted to plastocyanin, which is essential in plants. At higher Cu levels, FeSOD expression is shut off, saving Fe for other uses, and Cu/Zn SOD becomes a sink for Cu in the stroma. We found a signaling pathway, which senses the Cu that is available to the chloroplast and which mediates the microRNA-

mediated down-regulation of non-essential nuclear-encoded Cu-proteins under Cu limitation.

Contact

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Jeudi 20 mars : Christophe Brugidou

Jeudi 27 mars : Alessandro Vital