PlantStressMetalPTMs Project

INVESTIGATING THE ROLE OF POST-TRANSLATIONAL MODIFICATIONS IN CADMIUM TOLERANCE AND ACCUMULATION IN THE METAL HYPER-ACCUMULATOR *ARABIDOPSIS HALLERI*

Pollution of soils by heavy metals is a major threat to human and environmental health. A better understanding of the effects of these toxics on the physiology of plants is essential to develop approaches for treating contaminated soils (phytoremediation) and limiting the intake of toxic metals from plant-derived food. Plant hyper-accumulators are able to grow in metal-contaminated soils and display extraordinary metal accumulation in their shoots without phytotoxic effects. Arabidopsis halleri is constitutively tolerant and hyper-accumulator of zinc and cadmium (Cd), thus being considered as a model in molecular studies of the adaptation to anthropogenic metal stress. The mechanisms allowing for enhanced metal uptake, root-to-shoot translocation and detoxification are not fully understood. Given their pivotal role in the dynamic regulation of many cellular processes, post-translational modifications (PTMs) are involved in the fine-tuning of the plant response to environmental stresses. However, little is known about the role of PTMs regarding metal stress. In this project, we plan to analyze the role of some PTMs in metallicolous and non-metallicolous A. halleri populations with distinct capacities to tolerate and accumulate Cd. To this aim we will characterize the expression profiles of proteins modified by methylation or phosphorylation and of genes coding the enzymes catalyzing PTMs (methyltransferases, kinases, phosphatases) in A. halleri populations challenged by Cd. Using this multi-scale approach, from the molecular to the population levels, we anticipate that we will identify modified proteins as molecular markers of the Cd tolerance and/or hyper-accumulation traits in A. halleri. This project will provide the foundation for the discovery of new molecular mechanisms governing metal homeostasis and adaptation of plants to extreme environmental constraints.

PARTNERS

UMR 5168 - Laboratoire de Physiologie Cellulaire Végétale

Leader: **Stéphane Ravanel** is a senior research scientist at INRA, with knowledge and experience in protein biochemistry, plant physiology and metabolism. His current research focuses on plant response to stresses induced by toxic metals, with a particular interest in the role of protein post-translational modifications in this process.

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