



PEROS

Deciphering the relationships between protein persulfidation and oxidative stress

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Summary

Context — The oxidative modification of cysteine residues to persulfides (protein persulfidation) is now well recognized as an important redox post-translational modification in most living organisms, including plants. Proteomic analyses suggest that persulfidated proteins participate in a wide range of biological functions, regulating important processes such as carbon metabolism, plant responses to abiotic and biotic stresses, plant growth and development, protein translation and autophagy. In this project, we aim at investigating the relationships between protein persulfidation and oxidative stress in poplar in the context of an acute ozone (O₃) stress, a powerful oxidizing agent.

Objectives — We wish to address three major questions:

1. What is the impact of oxidative stress on the persulfidome in poplar?
2. Is there a correlation between a reactive oxygen species-generating stress and protein persulfidation?
3. Do the enzymatic reducing systems participate in the regulation of protein persulfidation by exhibiting a specific depersulfidase activity?

Approaches — The work plan is divided into three tasks. The first one consists in evaluating the level of persulfidated proteins in leaves of various poplar genotypes treated or not with O₃. The second task will be devoted to proteomic analysis of the O₃-dependent persulfidome of poplar genotypes with higher protein persulfidation levels. In the third task, the ability of various enzymes to reduce persulfidated proteins will be determined.

Expected results and impacts — This project will extend the fundamental knowledge concerning the molecular mechanisms underlying the protein persulfidation in poplar, a model tree organism (i) by generating new insights into the occurrence, mechanisms and specificity of protein persulfidation during oxidative stress (ii) by identifying the persulfidome of poplar grown under normal and oxidative stress conditions and (iii) by identifying the enzymes involved in the reduction of persulfidated proteins.