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Posttranslational control for Chlorophyll and Heme synthesis

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Tetrapyrrole biosynthesis (TPB) in plants consists of more than twenty enzymatic steps and is tightly controlled due to the synthesis of photoreactive intermediates and the different spatial and temporal requirements of their end products chlorophyll and heme. At the TPB hotspots, many complementary post-translational control mechanisms act on specific enzymes: The two enzymes glutamyl-tRNA reductase (GluTR) and glutamate-1-semialdehyde aminotransferase (GSAAT) provide the rate-limiting step of 5-aminolevulinic acid (ALA) synthesis at the beginning of the TPB pathway. At the branch point to chlorophyll and heme synthesis, Mg chelatase, a protein complex consisting of three different subunits, is responsible for the transfer of protoporphyrin to chlorophyll synthesis. The light-dependent protochlorophyllide oxidoreductase also requires several control mechanisms to prevent substrate accumulation in the dark and to ensure the activity and stability of the enzyme under unfavorable environmental conditions. Thus, several factors of these post-translational control mechanisms ensure a finely tuned metabolic flux in TPB at the level of activity, stability, oligomerization and subplastidal compartmentalization of the enzymes involved. In recent years, we have successfully contributed to elucidate several complex control processes at these foci during day, night and under changing conditions in nature. The talk will present some of the regulatory strategies recently investigated by our group for the post-translational control of TBP by regulatory and supporting factors

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