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Daily and seasonal fluctuations of isoprene biosynthesis-related gene expression in poplar (*Populus* x *canescens*) and its relation to isoprene emission

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The plastidic methylerythritol phosphate (MEP)-pathway for biosynthesis of isoprenoids leads, amongst other products, to the phenomenon of the light and temperature dependent emission of isoprene, especially in some trees, as in grey poplar (*Populus* x *canescens*). Beside its importance for atmospheric chemistry, the physiological function of isoprene emission for the plants themselves is widely unknown. Actual hypotheses are supposing improved thermotolerance, protection against oxidative stress or function as metabolic valve for excessive energy and carbon.

All metabolic intermediates of the MEP-pathway are now basically described but how the regulation of biosynthesis and emission proceeds is not yet understood. Two possible committed steps in the MEP-pathway are the deoxyxylulose 5-phosphate (DOXP)-reductoisomerase (DXR) catalysing the first specific reaction of the MEP-pathway and isoprene synthase (ISPS), the key enzyme releasing isoprene from its precursor dimethylallyl diphosphate (DMADP).

The presentation summarizes our actual work on molecular, biochemical and physiological aspects of isoprene formation in order to understand its regulation in poplar. Daily and seasonal variations of *dxr* and *ispS* gene expression in relation to enzyme activity, DMADP pools and isoprene emission rates according to long and short term changes in light and temperature will be shown. Furthermore immunological and im-

munohistochemical data on the tissue-specific localisation of ISPS will be presented.

This combination of this information leads to a better understanding how environmental factors influence isoprene emission and offers the opportunity to improve and develop process-based emission models.