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Poster Abstract – I.02

STUDY OF TWO ARABIDOPSIS GENES MODULATED BY CADMIUM

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Heavy metals and metalloids such as Hg, As, Cd and Pb are extremely toxic, and pollution caused by these metals is a major environmental concern. These elements exert their toxicity by causing oxidative damage such as lipid peroxidation, enzyme inactivation, and DNA damage and by binding to protein sulfahydryl groups. Cadmium, in particular, is strongly phytotoxic, causes growth inhibition, and may cause plant death by interfering with important biochemical pathways. Our work is focusing on the molecular characterization of plant genes responsive to Cd treatment.

The Arabidopsis Myb59 encodes a transcriptional factor belonging to the R2R3MYB family and it is present in three splicing variants. It is under investigation because it was observed that one of the three variants (Myb59-1) is strongly induced by Cd treatment. Tobacco and Arabidopsis plants overexpressing Myb59-1 did not showed symptoms of Cd toxicity manifested with chlorosis and growth reduction in wild-type plants. In addition, the presence of this heavy metal in colture medium affected leaf morphology of wild-type plants whereas plants overexpressing Myb59-1 showed normal leaves. The effect of Myb59-1 was even more manifested in roots. In wild-type plants, it was observed the presence of many root primordia that do not develop lateral roots when grown in Cd-supplied medium, conversely, transgenic plants showed normal lateral root growth even in presence of high Cd concentration. Work is in progress to understand the role of Myb59-2 and Myb59-3 in relation to the presence of Cd and other environmental stresses.

It has been demonstrated that Cd exposure affects the circadian pattern of plasma testosterone levels in adult rats but the influence of this heavy metal on plant circadian clock has never been considered. We have study its effect on the expression of EARLY FLOWERING 4 (ELF4), a gene involved in photoperiod perception and controlling circadian rhythms and flowering time. It was observed that Cd inhibits the oscillatory expression of ELF4 when plants were maintained on daily light/dark cycle. Cd also altered the ELF4 expression pattern when plants were kept for many days under conditions of continuous light or continuous darkness. Furthermore, flowering time was monitored in transgenic Arabidopsis plants overexpressing ELF4 and treated with Cd. In wild-type plants Cd anticipates the time of flowering. The constitutive expression of ELF4 led to a delay in flowering time and a continuous plant growth, the exposure to Cd induced a further delay in flowering time and inhibition of plant growth. These data suggest that Cd exerts effects in plant circadian system which drives rhythms of many physiological processes and plant behaviour.